VOLUME 34 NUMBER 3 MARCH, 1951

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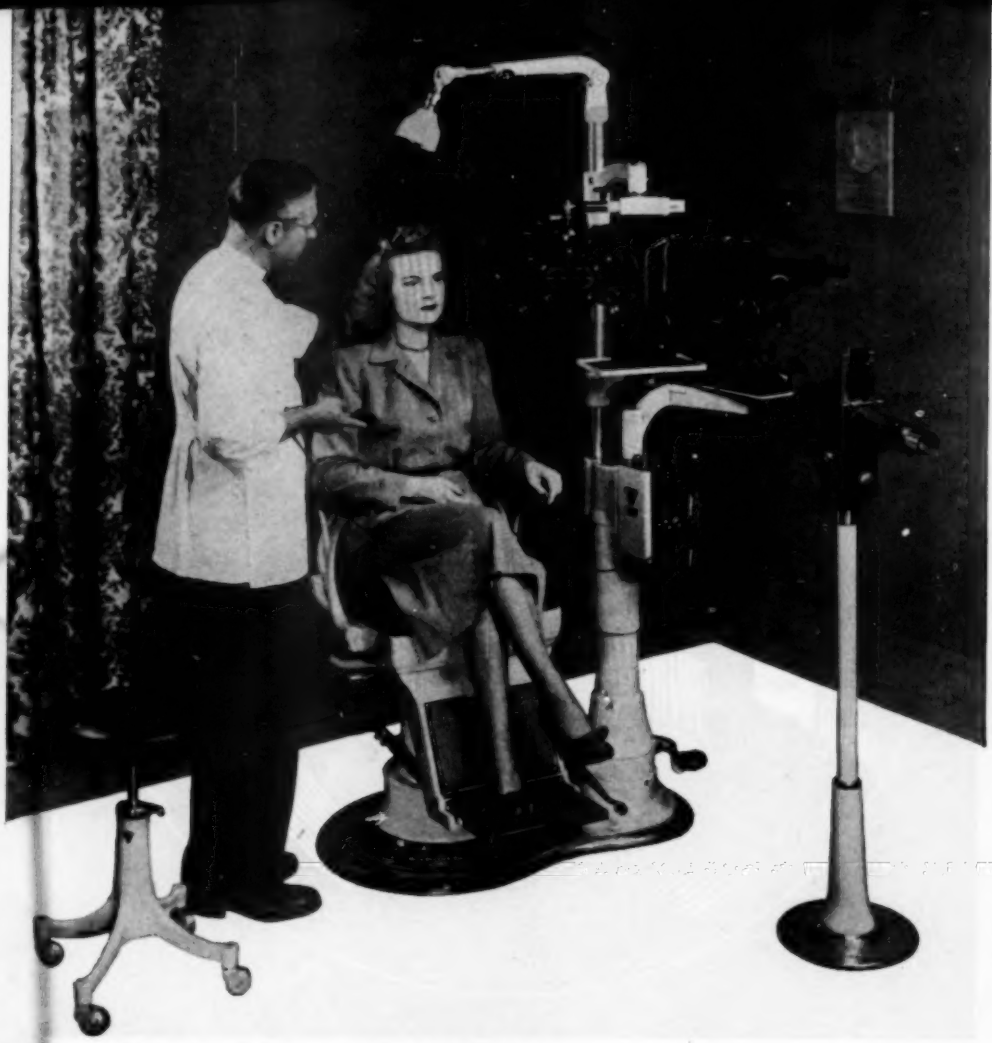

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The solution was simple when it was found that due to facial structure, the trial frame tilted about 15 degrees in respect to the vertical plane. When spectacles were tilted the same amount, the acuity was the same as with the trial lenses.

If it were not practical to tilt the spectacle lenses to the desired angle, the resultant lens power could have been easily calculated. In most cases such a procedure is much more desirable than tilting the lenses.

A workable rule of thumb to determine the effects of tilting a sphere is as follows: A 4.00 D lens tilted 20 degrees produces a .50 cylinder whose axis is toward the tilt. There is, of course, a slight sphere change but of negligible amount.

When determining the effects of tilting a cylinder lens, the axis of the cylinder is a factor, because, for example, a +4.00 cylinder axis 180 with the top tilted forward 20 degrees, has the power of a +4.75 cylinder (approximately), while a +4.00 cylinder axis 90 is not affected by a forward tilt.

The table below shows the effects of tilting both a one diopter sphere and a one diopter cylinder.

Spherical Lens			Cylindrical Lens	
Degrees Tilt	Power Sphere	Induced Cylinder	Degrees Tilt	Power Cylinder
0	1.00	0.00	0	1.00
5	1.00	0.01	5	1.01
10	1.01	0.03	10	1.04
15	1.02	0.07	15	1.10
20	1.04	0.14	20	1.18
25	1.06	0.23	25	1.29

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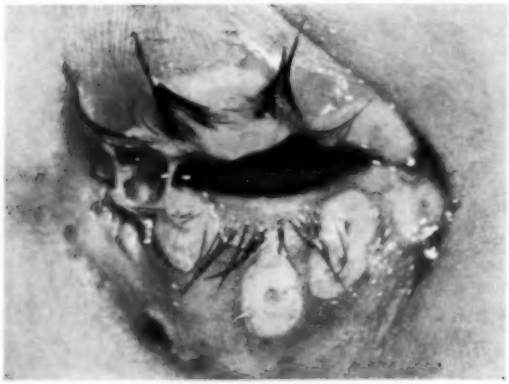

FIGURE 1

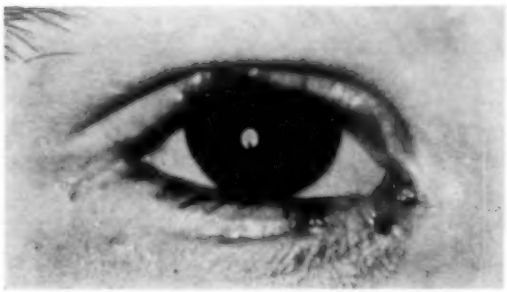

FIGURE 2

FIGS. 1 AND 2 (KING AND ROBIE). (FIG. 1) PRIMARY VACCINIA OF THE EYELIDS. THE LESIONS COVERED BOTH LID MARGINS FROM THE INNER TO THE OUTER CANTHUS. (FIG. 2) FOUR DAYS AFTER TREATMENT WAS BEGUN, THE ULCERS HAD COMPLETELY HEALED AND DEPRESSED SCARS REMAINED ON BOTH LIDS.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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PRIMARY VACCINIA OF THE EYELIDS*

TREATMENT BY AUREOMYCIN

J. HARRY KING, JR., M.D., AND WILLIAM A. ROBIE, M.D.
Honolulu, Hawaii

Accidental vaccination of the eye is very uncommon considering the great number of vaccinations which are performed daily. Approximately 200 cases have been reported in the past 50 years.[1] There are, no doubt, many cases which have been unreported or unrecognized.

Ocular involvement may concern the eyelids, the conjunctiva, or the cornea. This is usually caused by contamination from a primary vaccinia in the same patient or another person. The skin of the lids and the conjunctiva are the most common sites for these lesions and the cornea becomes involved in about one third of those affected.[1] The resulting scarring of the lids and conjunctiva may necessitate plastic repair. Corneal involvement frequently results in visual damage and may mean total loss of the globe.

Some authors[2] feel that the lid scarring is much less severe than that which follows the usual vaccination of the arm or leg. This may be due to the fact that there is less virus present on the lids and that the lesion is kept moist by the tears which may have same antiviral effect. In cases of contamination from the same patient some immunity may also be present from the original vaccination.

It is extremely important to prevent corneal involvement when the lids or conjunctiva became infected. Treatment in the past has been mostly symptomatic. Atkinson and Scullard,[3] however, investigated various therapeutic measures aimed specifically against the vaccinia virus. They suggested methods of treatment which appeared to be of value experimentally in preventing corneal involvement. They had no opportunity to apply these measures to the human being.

They advised: (1) The avoidance of trauma which might possibly cause corneal inoculation, especially exercising great care in opening the swollen lids. (2) The use of cuffs for young children to keep them from touching the lids with the fingers. (3) The application of potassium permanganate (1:100,000), tincture of iodine, metaphen, or mercury bichloride (1:10,000) directly to the lesion as soon as the condition is diagnosed. (4) The administration of ascorbic acid, both locally and systemically, because of its oxidizing properties. (5) Immune serum against the virus vaccinia, given by injection to increase general immunity, and applied locally to inactivate the virus.

They found that sulfanilamide and sulfapyridine did not inhibit the action of the virus.

Some encouragement in the treatment of certain virus infections has recently been given by use of aureomycin. Marked viricidal effect has been noted experimentally and clinically against the psittacosis-lymphogranuloma venereum group of organisms.[4] The virus of primary atypical pneumonia,[5, 6] dendritic conjunctivitis due to herpes simplex virus,[7] and inclusion conjunctivitis[7] all have responded to aureomycin therapy.

This potent antiviral action suggests a

* From Tripler General Hospital.

similar effectiveness against the vaccinia virus, whose elementary bodies resemble those of lymphogranuloma venereum.

In a recent case of massive multiple primary vaccinia of the eyelids, the use of aureomycin, together with the measures already mentioned, was followed by dramatic subsidence of the lesions.

Report of the Case

Vaccinia of the lids in this patient was considered a primary inoculation, either transferred from the original site which did not "take" or from the brother who had a primary reaction.

History. A boy, aged two years, was seen in the eye clinic on August 25, 1949, with a history of having had a red "pimple" on the outer portion of the lower lid five days before. The mother stated that this became a yellow "blister" in several days, and was followed by multiple similar lid lesions the day prior to coming to the eye clinic. Two weeks before the appearance of the first lid lesion the child had been vaccinated on the left upper arm with no reaction. A brother was vaccinated at the same time and received a primary vaccinia reaction.

Examination showed marked inflammation and edema of the lids of the right eye, with numerous vesicles and early pustules of both lid margins. The lesions were discrete, mostly pustular and umbilicated, varying in diameter from three to six mm. They covered both lid margins from the inner to the outer canthus (fig. 1).

Marked induration of the lids and conjunctiva was present but no lesions involved the conjunctiva or cornea. The eye could not be opened voluntarily and it was difficult to open it manually. There was tenderness and swelling of the preauricular and submaxillary glands on the same side. No other skin lesions were noted on the body and there were no constitutional symptoms.

A smear and culture of mucoid material from the conjunctiva revealed no specific organisms. Smears and cultures from a large lid pustule likewise were negative for bacteria.

The material from the pustule produced a classical vaccinia when it was inoculated upon a rabbit's thigh on two occasions. A small reddish papule followed inoculation on the rabbit on the third day which then progressed to an umbilicated vesicle and a yellowish pustule. This was finally followed by crusting.

Material from several lesions was frozen for preservation and later was implanted upon fertile egg yolk as a culture medium. These cultures died in the first 24 hours, however, and it was therefore impossible to demonstrate typical vaccinia growth and Guarnieri bodies upon microscopic examination.

Treatment was begun immediately to prevent spread to the cornea, and consisted of:

1. Mild restraint of hands. The patient was an exceptionally coöperative two-year-old child who required restraining only during his sleeping hours.

2. Aureomycin per mouth (50 mg./Kg./24 hr.) for 96 hours (250 mg. every eight hours).

3. Aureomycin borate eye drops (5.0 mg./cc.) by flushing the conjunctival sac and lid lesions four times daily for seven days.

4. Penicillin (aqueous) 100,000 units intramuscularly, twice daily, for five days.

5. Potassium permanganate (1:100,000) solution made fresh daily, wet compresses for one-half hour, four times daily.

6. Ascorbic acid (50 mg., twice daily) by mouth.

Course. Striking improvement was noted in 24 hours. The edema began to subside and the lid lesions, although moist, were stationary in character. The lids could be manually opened with less force, and the conjunctiva and cornea were uninfected.

In 72 hours, there was almost complete subsidence of the condition. Edema was very slight, and the pustules were desiccated in appearance. Four days after treatment was

begun, the ulcers had completely healed and depressed scars remained on both lids (fig. 2). There was loss of lashes in the middle third of the upper lid where the largest lesion had been and on two small areas of the lower lid. No permanent sequelae other than mild scarring was noted after two weeks.

Comment

Certain observations might lead one to suspect the correctness of the diagnosis in this case. The rapid abatement of the lid lesions was most unusual. The lack of a primary take on the arm and the late appearance of the lid lesions two weeks after the vaccination were not characteristic.

A small primary take on the lid may have been present prior to this time, however, as the mother was not too certain about the date of its origin. At the time the patient was first seen here the lesions resembled those of a third to fourth day vaccinia. It is probable that the child became infected from contamination by the brother's vaccinia.

The appearance of the discrete, elevated, pustular lesions which later became umbilicated, was identical with that seen in vaccinia.[8] The inoculation of this material upon a rabbit's thigh, causing the production of typical vaccinia, was confirmatory of the causative agent.

Complement fixation and agglutination tests were not done due to the unavailability of the necessary antivaccinial serum.

Summary and Conclusions

A case of multiple vaccinia of the eyelids in a two-year-old boy, without a primary take elsewhere, is reported. In addition to methods of treatment previously advocated by others,[3] aureomycin locally and parenterally was employed. The lesions abated in 72 hours and there was complete disappearance of the condition in four days. This is a dramatic recovery compared to the usual 28- to 31-day course of untreated vaccinia.[8]

It is impossible to state definitely that aureomycin was the cause of the rapid subsidence of this condition in view of the fact that other methods of treatment were used. Penicillin is not generally considered to possess potent antiviral action. It was used in this case as a precaution against secondary bacterial infection. The known value of aureomycin as a viricidal agent, however, lends credence to the assumption that it was effective against vaccinia.

The use of aureomycin parenterally and locally appears to be a promising therapeutic measure in ocular vaccinia as a means of preventing damaging sequelae which may even cause loss of vision. It is hoped that this report will stimulate further investigation in order to determine the therapeutic effect of this antibiotic in ocular and other vaccinial complications.

APO 438, c/o Postmaster,
San Francisco.

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ROENTGEN THERAPY OF OCULAR VACCINIA*

ORAM R. KLINE, JR., M.D.
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Ocular vaccinia has existed as a disease entity since the introduction of vaccination by Jenner in 1796. In all the succeeding time, many remedies have been advocated for the treatment of this condition—which is indication enough that none have been entirely satisfactory.

Among the many therapeutic agents suggested have been potassium-permanganate flushes (1:100,000), ascorbic acid locally and generally, immune serum, estrogens, ultraviolet light, repeated vaccinations, and the antibiotics. All of these measures have received varying amounts of support, but still no one has been able to prevent the disabling deep keratitis which develops in about 20 percent of the cases.

It is true, of course, that the condition is not a common one. In 1940,[1] slightly more than 200 cases had been reported. The number is indeed quite small when one considers the large number of vaccinations performed every year.

In 1947 Pitman, Holt, and Harrell[2] reported a case which they treated with X-ray therapy. They subjected their patient to 22 r per minute for four minutes the first day, and for three minutes the second, third, and fourth days—a total of 286 r. They noted a marked reduction in the swelling within 48 hours after the initial treatment, and the patient quickly recovered with no corneal complications.

Their success with this case led them to carry out, with Reid, Little, Mankin, and Morris,[3] a series of experiments on the roentgen therapy of induced ocular vaccinia in rabbits. Their results were quite impressive and well warranted their conclusion that "roentgen therapy for primary or secondary vaccinial infection of the eye hastens regression of the acute lesion and probably diminishes the residual corneal opacities."

These writers did not indicate that their idea was original, but it was found on surveying the literature that X-ray therapy has been little used in the treatment of vaccinia. No other references could be found in the American literature, and the foreign literature on the subject is also meager. In 1927, Le Fevre[4] reported that roentgen rays were effective in the reduction of the extent of vaccinial lesions in the skin of rabbits; and, in 1946, Maury and Frilley[5] reported on the effect of roentgen rays on the vaccine virus.

Apparently, roentgen therapy has not been used to any great extent in the treatment of clinical ocular vaccinia. The literature, though scant, is optimistic, and indicates that X rays are worthy of further trial.

It was with this thought in mind that we decided to include X-ray therapy in the treatment of a case of ocular vaccinia admitted to The Wills Eye Hospital this year.

CASE REPORT

History. On October 11, 1949, G. T., a four-year-old colored girl, was admitted to The Wills Eye Hospital with the chief complaint of a painful swollen right upper eyelid of four days' duration.

The patient's mother stated that, four days before, the patient had apparently developed a stye on the right upper eyelid. This had increased in size, and on the day of admission the lid had become so swollen that it was impossible for the patient to raise it.

General physical examination revealed that the patient was apparently quite toxic. Rectal temperature was 103°C. Examination showed the nose, throat, heart, lungs, and abdomen to be normal.

Eye examination. The right upper eyelid

* From the service of Dr. Louis Lehrfeld, The Wills Eye Hospital.

was swollen to several times its normal size (fig. 1). Along its lower border were noted seven circular lesions—all about 3.0 mm. in diameter. These lesions had raised edges and were definitely depressed in the center. One similar lesion was noted on the border of the lower lid. A scant seromucinous discharge was present, and a large submaxillary node was palpable on that side.

The lids were carefully separated with retractors but the cornea could not be seen. The conjunctiva was quite chemotic and completely hid the cornea from view.

Fig. 1 (Kline). Appearance of eye on admission.

Later in the day the eye was examined again, and this time the cornea was reported as being seen and appearing grossly normal. Further examination of this eye was impossible, however, because of the extensive swelling of the lids and the marked chemosis of the conjunctiva.

Examination showed the left eye to be normal in all respects.

A relatively fresh vaccination scab, about one cm. in diameter, was noted on the left upper arm. The mother stated that the child had been vaccinated on September 30th (seven days before she began to have trouble with her eye, and 11 days before her admission to the hospital).

In view of the history and physical findings, the diagnosis of vaccinia of the right eyelids, secondary to a primary inoculation of the left arm, was made.

Culture revealed Staphylococcus albus and pneumococcus.

Fig. 2 (Kline). Appearance of eye 48 hours after therapeutic regime was instigated.

Treatment. The patient was isolated and the following therapeutic regime instituted: (1) Crystacillin (300,000 units daily); (2) penicillin collyrium (2,500 units per cc.) every hour; (3) aureomycin drops (0.5-percent) four times daily; (4) boric acid flush, twice daily; (5) hot compresses, four times daily; (6) roentgen therapy—consisting of three treatments on successive days of 50 r each (total of 150 r).

Course. Forty-eight hours later the swelling had largely subsided. The lesions had crusted and the clear cornea was seen without difficulty (fig. 2). The child's temperature fell almost to normal by nine o'clock the night of admission and remained so until her discharge three days later.

The child was seen again on October 23rd (nine days after her discharge from the hos-

Fig. 3 (Kline). Appearance of eye nine days after discharge from hospital.

pital and 16 days after the onset of the condition). The lesions were completely healed, leaving small definite white scars (fig. 3). An absence of cilia was noted in the involved regions.

One month after the onset the child again returned for examination. At that time no trace of the previous scars could be found

Fig. 4 (Kline). Appearance of the eye one month after onset of ocular vaccinia.

(fig. 4). The cilia were beginning to grow in the formerly affected areas. The cornea, as on admission, was clear.

Comment

This patient was treated successfully, but now the familiar situation arises—to which of our therapeutic agents should go the credit: penicillin, aureomycin, or X-rays.

We do believe that the course of the disease was altered by the therapy. However, these secondary inoculations, as a rule, run a much more rapid course than the primary inoculations, due to the increasing body immunity.

Their usual course is 8 to 10 days, but this varies greatly, as the longer the lapse of time between the primary and secondary inoculation, the more quickly does the secondary infection run its course and heal. In this case, however the healing was so dramatic that we do feel that the clinical course was altered by one of these three therapeutic agents.

Penicillin has been used in these cases before. It is of great value in combating secondary infection but has little effect against the virus. It has been found experimentally that penicillin, when injected into rabbits within 24 hours after inoculation with a rabbit-passed vaccinia virus, will prevent the typical lesion from developing. However, if it is injected later than this the course of the disease is unaltered.[6]

One case of eczema vaccinatum treated successfully with oral aureomycin has been recently reported in the literature.[7] Perhaps aureomycin will become a valuable aid in the treatment of ocular vaccinia. However, we only used three drops in the conjunctival sac of the right eye, four times daily. This might have been of some aid in preventing corneal complications but we do not feel that it could have caused the dramatic improvement in the lid lesions—with which it did not even come in contact.

X rays were our only other therapeutic agent and it is to them we think credit is due. Our result was very similar to the case reported by Pitman, Holt, and Harrell. We, however, gave a total of only 150 r in contrast to their total of 256 r.

The exact method by which X rays work in this condition is not known. Possibly, as Pitman, Holt, and Harrell suggested, it acts by diminishing the rate of spread of the virus through the tissue. It is known that it does not act by killing the virus. It has been shown experimentally in vitro that roentgen irradiation will reduce the infectivity of vaccinial lymph, but the dosage required is extremely high and would not be tolerated by the eye.[8]

Summary and Conclusions

1. A case of ocular vaccinia has been discussed.

2. An attempt to evaluate the efficacy of

roentgen therapy as a therapeutic agent in this condition has been made.

3. The experimental and clinical work on the treatment of vaccinia with X-ray therapy, though meager, is worthy of note.

4. Roentgen therapy should be included more often as an agent in the treatment of ocular vaccinia so that its worth might be better evaluated.

16th and Spring Garden Streets.

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TOPICAL CORTISONE IN THE TREATMENT OF ANTERIOR-SEGMENT EYE DISEASE*

E. H. STEFFENSEN, M.D., A. J. WISHBOW, M.D., F. O. NAGLE, M.D., R. W. SMITH, M.D., AND E. L. WHITNEY, M.D.

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In a previous paper[1] it has been pointed out that the therapeutic benefits derived from fever therapy, which is so commonly used in the treatment of ocular disease, probably result from stimulation of the pituitary-adrenal system. The basic mechanism appears to be the liberation of pituitary adrenocorticotropic hormone (ACTH) with resultant stimulation of the adrenal cortex. On this premise, ACTH has been used in the treatment of a variety of ocular diseases, and excellent results have been obtained, especially in acute inflammatory lesions.

In the reports of several investigators[2-5] it was postulated that the 11-oxycorticosteroid group was of basic importance in the response to injury and disease. It seemed possible, then, that the benefits from ACTH in the treatment of ocular inflammatory disease was achieved primarily through liberation of the 11-oxycorticosteroids. To test this hypothesis, one of these steroids, 11-dehydro-17-hydroxycorticosterone (cortisone†), was used in a series similar to the one treated with ACTH. As previously reported,[6] the results in the two series were comparable.

It seemed theoretically possible that cortisone might have physiologic activity when applied directly to ocular tissues and might even penetrate the cornea in quantities sufficient to alter inflammations of the anterior

* From the Divisions of Ophthalmology and Metabolism, Henry Ford Hospital.

† The 11-dehydro-17-hydroxycorticosterone in the acetate form (Cortone Acetate of Merck) was made available through the courtesy of Dr. J. M. Carlisle, Medical Director, Merck Laboratories, Rahway, N.J. This preparation is a crystallin suspension of cortisone acetate, 25 mg. per cc. in normal saline, with suspending agents and 1.5-percent benzyl alcohol as a preservative.

TABLE 1

TOPICAL CORTISONE IN TREATMENT OF ANTERIOR-SEGMENT EYE DISEASE

Case	Age	Race	Sex	Diagnosis	Treatment		Results
					Frequency	Duration	
1. G. G.	53	W	F	Nonspecific keratitis profunda	q.1 h q.3 h.	10 days 36 days	Marked clearing of cornea with complete subjective relief in 3 days; completely clear in 46 days
2. L. C.	48	W	M	Nonspecific keratitis profunda	q.½ h. q.1 h. q.3 h.	5 days 11 days 12 days	Relief of subjective symptoms in 3 hrs.; moderate improvement in 5 days; grossly clear cornea in 28 days; recurrence after treatment but again controlled with cortisone
3. C. V.	9	W	F	Nonspecific superficial keratitis	q.½ h. q.1 h. q.i.d.	3 days 1 day 5 days	Marked improvement in 3 days; complete clearing in 4 days
4. B. B.	59	W	M	Nonspecific superficial keratitis	q.1 h. q.2 h.	12 days 13 days	Pain gone in 2 days; grossly clear after 12 days; complete clearing after 25 days
5. M. S.	64	W	F	Postoperative striate keratitis	q.2 h. q.i.d.	21 days to present	Pain gone in 3 days; gross clearing after 3 weeks; attenuation of vessels and clearing of Descemet's membrane after 77 days; treatment is being continued
6. M. T.	66	W	F	Postoperative striate keratitis	q.½ h. q.1 h. q.2 h.	9 days 11 days to present	Pain gone and conjunctival injection less in 18 hrs.; marked clearing of cornea in 9 days; treatbeing continued
7. H. K.	42	W	M	Phlyctenular keratoconjunctivitis	q.3 h.	17 days	Relief of pain, less injection and decrease in size of phlyctenule in 2 days; entirely clear in 17 days
8. R. S.	26	N	F	Phlyctenular keratoconjunctivitis	q.2 h. q.i.d.	21 days 14 days	Improvement after 1 week; completely clear in 21 days
9. O. W.	59	W	F	Bilateral tuberculous keratitis	q.1 h. q.2 h. q.3 h.	1 day 1 day	Complete relief of pain in 1 day; gradual reduction of conjunctival injection and corneal vascularity is still continuing; still receiving treatment
10. G. P.	36	W	F	Acne rosacea keratitis	q.2 h. q.i.d.	14 days 14 days	No subjective complaint after 3 days; conjunctival injection gone after 1 wk.; cornea clear except for residual scar at end of 2 weeks
11. E. W.	39	W	M	Dendritic keratitis	q.½ h. q.1 h. alternating with aureomycin for 6 days	4 days	Less irritation after 24 hrs.; no change in ulcer size after 10 days; healing occurred following iodine cauterization
12. I. K.	34	W	F	Dendritic keratitis	q.30 min.	4 days	Alleviation of pain and photophobia after 3 hrs.; no change in corneal ulcer after 4 days; complete healing slow over 5-wk. period following iodine cauterization
13. E. L.	37	W	M	Acute marginal corneal ulcer	q.½ h.	4 days	Less pain and ulcer smaller after 24 hrs.; ulcer healed after 48 hrs.; eye clear after 4 days
14. H. J.	70	W	F	Trophic corneal ulcer	q.1 h. 2nd course q.1 h.	14 days 6 days	Relief of pain after 4–5 hrs.; gradual healing over 14 days; ulcer recurred after treatment and progressed under further cortisone therapy
15. C. H.	65	W	M	Trophic corneal ulcer	q.½ h.	6 days	Less pain after 24 hrs.; little improvement after 6 days
16. H. S.	55	W	M	Fuchs's epithelial dystrophy	q.1 h. q.2 h.	7 days 4 wks.	No pain, less tearing while under therapy; little change other than some reduction in degree of bedewing and slight peripheral shrinkage of the lesion
17. W. S.	15	W	M	Vernal conjunctivitis	q.30 min. q.1 h.	3 days 15 days	Diminution of tearing and photophobia; papillae a little paler and flatter after 3 days; no further improvement; drops discontinued
18. N. C.	19	W	M	Vernal conjunctivitis	q.3 h.	1 wk.	Subjective relief during the first 2 days only; no objective improvement
19. J. F.	29	W	M	Chronic sarcoid iridocyclitis with secondary keratitis	q.1 h. q.3 h.	49 days to present	No pain and less conjunctival injection after 24 hrs.; conjunctival injection gone after 1 wk.; by 49 days the aqueous was free of cells and band keratitis showed some clearing
20. R. B.	56	N	M	Acute iritis	q.15 min. ☼ day q.1 h. ☾ night q.1 h. ☼ day 2×☾ night	3 days 6 days	No pain, and coagulum almost completely gone after 4 hrs.; coagulum gone, cells reduced, no flare after 24 hrs.; entirely clear by 3 days except for an occasional pigmented cell in aqueous
21. M. F.	64	W	F	Acute iritis	q.½ h. q.3 h.	3 days 7 days	Free of pain and fibrin in aqueous gone in 24 hrs.; eye clear at end of 3 days

TABLE I—(*continued*)

Case	Age	Race	Sex	Diagnosis	Treatment		Results
					Frequency	Duration	
22. R. T.	61	W	M	Acute iritis	q.½ h.	3 days	Iritis progressed under cortisone with formation of a coagulum
23. V. B.	26	W	M	Acute iritis with secondary glaucoma	q.30 min. q.1 h.	3 days 2 days	Tension normal; less pain and photophobia at the end of 24 hrs.; clear except for occasional cell and few fine precipitates on corneal endothelium by 5th day
24. C. K.	39	W	M	Acute iritis with secondary glaucoma	q.15 m. q.1 h. q.15 m.	6½ hrs. 14 hrs. 24 hrs.	Transient reduction in tension and corneal edema in 6½ hrs.; no improvement during 44 more hours of treatment; recovered in 3 days with parenteral cortisone

segment of the eye. The beneficial results of local cortisone in the treatment of several patients with anterior-segment eye disease have been previously reported.[6] Sufficient observations have now been made on 24 patients to justify the present report.

Case material

With the exception of three patients who were admitted to the hospital for more extensive study, the cases reported here were treated in the out-patient department of the Henry Ford Hospital. Ophthalmic observations, including careful slitlamp studies, were made daily to once a week, depending upon the severity of the disease process.

Method of treatment

The preparation for topical application was made by diluting one volume of the saline suspension of cortisone with four volumes of normal saline. Stronger solutions were mildly irritating but it was not clear whether this was due to the cortisone itself or to the suspending agents and preservative.

This preparation, in most cases, was initially instilled in the eye every 30 to 60 minutes during the waking period. As the disease process cleared, the interval between drops was usually lengthened. To minimize alterations in the physicochemical properties of the microcrystallin suspension of cortisone, patients were instructed neither to refrigerate nor heat the drops. The preparation was shaken immediately before being instilled. During the period of therapy no other definitive treatment was used except atropine cycloplegia in one case (Case 20).

Results

Of the 16 patients with corneal lesions all showed alleviation of symptoms within 3 to 72 hours. The two patients with nonspecific keratitis profunda (Cases 1 and 2) cleared in 46 and 28 days respectively. Case 1 previously had received intensive antibiotic and foreign-protein therapy without benefit. Case 2 showed recurrence of the corneal lesion the fourth day after the drops were withdrawn, but again responded when topical cortisone was resumed.

Cases 3 and 4 with superficial keratitis cleared completely in four and 12 days respectively.

Two cases of postoperative striate keratitis have been treated (Cases 5 and 6). Case 5 previously had improved under ACTH therapy, but regressed and became progressively worse when the parenteral hormone was discontinued. Pain, photophobia, and epiphora become so severe that the patient requested enucleation. After three days of topical cortisone the pain completely disappeared. In 10 days the eye was grossly clear, but there was little change in corneal scarring or vascularization. The patient has remained free of pain under the continued use of cortisone.

The second case of striate keratitis was less severe. Although fever therapy was ineffectual, there was complete relief of the subjective symptoms after 24 hours of treat-

ment with local cortisone. At the end of one month the cornea was nearly clear with the corneal vessels showing marked attenuation.

Two patients with phlyctenular keratoconjunctivitis (7 and 8) have been treated. Both were sensitive to old tuberculin and Case 7 showed repeated acute exacerbations under a desensitization program. Both cleared completely within 17 days.

Case 9, a severe, bilateral tuberculous keratitis of 17 years' duration, is of special interest. For five years the patient had complained of intermittent pain and constant photophobia. At the end of 24 hours of treatment the patient noted complete relief of pain, and after three weeks the photophobia had entirely disappeared. She was comfortable for the first time in five years. Under continuing treatment the corneal scars show evidence of clearing.

Case 10, one of recurrent acne rosacea keratitis of seven years' duration, had relief of subjective complaints in three days. This contrasts with the one to three months required with other methods of therapy during previous attacks. At the end of two weeks no active disease was evident.

The two patients with dendritic ulcer (Cases 11 and 12) experienced rapid, partial alleviation of subjective symptoms, but the corneal lesion in both did not respond to cortisone therapy. In each case it appeared that the cortisone might have delayed healing.

One patient with an acute marginal ulcer (Case 13) responded with relief of pain within 24 hours. When cortisone was discontinued at the end of four days the eye was completely clear.

Two cases of trophic ulcer (Cases 14 and 15) although relieved of pain, failed to show any definite objective benefit from topical cortisone.

One patient with Fuchs's epithelial dystrophy (Case 16) with a minimal response to local cortisone is showing a further and more definite response to topical testosterone.

Two cases of vernal conjunctivitis (Cases 17 and 18) failed to give objective response to cortisone therapy. One of these (Case 18) had previously shown striking improvement under ACTH, but regressed two weeks after withdrawal of the hormone.

Case 19 had a painful, chronically inflamed left eye from a long-standing sarcoid iridocyclitis. Just prior to cortisone therapy the patient had requested enucleation. At the end of 24 hours he was entirely free of pain, and after seven weeks of therapy no evidence of active iritis remained.

Five additional cases of iritis have been studied (Cases 20, 21, 22, 23, and 24). In two of these, (Cases 23 and 24) there was an associated secondary glaucoma. Cases 20 and 21 both cleared in three days, while Case 22 became progressively worse during a similar period of treatment. This latter patient subsequently responded to homatropine, hot compresses, and salicylates.

One of the two cases with secondary glaucoma (Case 23) had recurrent attacks of iritis during the preceding 14 months which were controlled by fever therapy and cycloplegia. With no medication but topical cortisone, the intraocular pressure was reduced to normal within 24 hours and the eye was essentially clear by the end of the fifth day.

The second case with glaucoma (Case 24) showed only a transient reduction of intraocular pressure and no objective improvement in the iritis after 44 hours of intensive topical therapy.

In two patients in whom laboratory studies were made during hospitalization no changes indicative of the general systemic action of cortisone were observed during that period of treatment.

Case reports

Case 1

Nonspecific keratitis profunda. G. G., a white woman, aged 53 years, complained of an inflamed left eye of five weeks' duration. Intramuscular penicillin, intravenous typhoid, and atropine given elsewhere failed to arrest the disease process. On admission to the hospital, March 8, 1950, general physical examination was within normal limits. No foci of infection was found.

Old-tuberculin and brucella skin tests were negative. Visual acuity was: O.S., 20/137—1. Under the slitlamp the lateral three fourths of the cornea revealed bedewing with the stroma showing increased thickness and cloudiness. There were several large plaquelike precipitates and numerous small keratic precipitates over the posterior cornea, and the entire endothelial surface was covered with fine linear deposits of fibrin. A moderate number of cells were present in the anterior chamber. Intraocular pressure was 27 mm Hg. (Schiøtz).

Initial laboratory studies were: R.B.C., 3.9 million; hemoglobin, 12.6; W.B.C., 6,500, with 45 polymorphonuclears, 50 leukocytes, four monocytes, one basophil; urinalysis, normal; Kline exclusion, negative; direct eosinophil count, 86. During treatment there was no significant change in either the eosinophil count or white blood count.

Topical cortisone was started on March 13th, one drop every hour during the waking period. At the end of three days there was complete relief of mild pain and photophobia and the cornea showed loss of bedewing and definite clearing of the stroma.

Tension was now 23 mm. Hg and remained at or below this level during treatment. Fewer cells were present in the aqueous. When discharged from the hospital on March 23rd, the cornea showed further clearing and only an occasional cell remained in the anterior chamber.

Medication was continued every three hours at home. By the 17th day only a granular stippling marked the site of the original lesion and this was reflected by a visual acuity of 20/25. At this time the aqueous was completely clear and only a few resolving keratic precipitates were evident. At the end of 46 days the eye was completely clear except for a little residual scarring of the cornea.

CASE 2

Nonspecific keratitis profunda. L. C., a white man, aged 48 years, complained of an irritated eye for two months and blurred vision for one month. He noted little redness until two days prior to his first visit. The only treatment consisted of an unknown eyedrop prescribed elsewhere.

Examination revealed marked ciliary injection. The cornea showed a large area of bedewing with deeper infiltration involving the lower half and extending almost to the limbus. The anterior chamber was clear and the intraocular pressure was normal. No improvement resulted from two days of aureomycin drops.

He was then started on cortisone, one drop every 30 minutes. When examined at the end of 24 hours, there was definitely less ciliary injection and the patient said that irritation had disappeared after three hours. On the fifth day the corneal lesion showed peripheral clearing and was about half its original size. At that time the cortisone was reduced to every hour.

On the ninth day, six small keratic precipitates were noted in the central area, but there were still no cells in the anterior chamber. The corneal lesion appeared about the same.

By the sixteenth day the corneal infiltration was less dense and the keratic precipitates were smaller. At this time the dosage was reduced to every three hours and this was continued for 12 more days. At the end of treatment the eye was grossly clear and only a faint central corneal opacity could be seen with the slitlamp. No keratic precipitates were present.

Three weeks later the patient returned, stating that, four days after the drops had been discontinued, the eye again became injected. On examination the residual corneal opacity had increased in density but not in size. Moderate circumcorneal injection was present. Two days later topical cortisone, one drop every two hours was begun. By the fourth day of treatment the ciliary injection was gone and there was some reduction in the corneal infiltration, but about 12 keratic precipitates were present; four days later these were reduced in number and size. There was no ciliary injection but the corneal infiltration was unchanged. After 10 more days of treatment the eye was again clear except for faint corneal scarring and three crenating keratic precipitates. Cortisone drops are being continued.

CASE 3

Nonspecific superficial keratitis. C. V., a white girl, aged nine years, complained of intermittent redness of the left eye for several weeks and irritation and tearing for five days. Previous treatment consisted only of application of an ophthalmic ointment for two days.

Examination revealed marked conjunctival injection and the cornea showed numerous superficial staining areas with one larger central linear stain. The anterior chamber was clear. This patient was placed on cortisone, one drop every 30 minutes during the waking period, and every two hours at night. In 24 hours, there was nearly complete symptomatic relief but no objective change.

At the end of two days there was definitely less conjunctival injection, but still no corneal change. At the end of three days there was marked improvement with only two or three faintly staining areas and minimal conjunctival injection. The dosage was then reduced to every hour and at the end of four days the eye was entirely clear. Topical cortisone was continued four times daily for another five days. There has been no recurrence during a five-week follow up.

CASE 4

Nonspecific superficial keratitis. B. B., a white man, aged 59 years, complained of a "red, sore" right eye for 24 hours. Examination revealed a swollen upper lid and severe bulbar and palpebral conjunctival injection. There was considerable corneal bedewing with a punctate stain over the lower half. One-plus cells were present in the anterior chamber, but no flare. Finger tension was normal.

Cortisone, every hour, was begun and when reexamined at the end of two days he was free of pain. The conjunctival bedewing and injection had

decreased and there was only an occasional cell in the anterior chamber.

After four days there was only minimal conjunctival injection but still slight bedewing of the cornea. The anterior chamber was completely free of cells. At the end of 12 days the eye was entirely clear except for a few minute cellular deposits on the corneal endothelium. At this time the cortisone was reduced to one drop every two hours. When last examined at the end of 25 days of treatment, even these fine deposits had disappeared.

CASE 5

Postoperative striate keratitis. M. S., a white woman, aged 64 years, developed a severe striate keratitis nine weeks after cataract extraction of the right eye in October, 1949. In December, 1949, this keratitis cleared moderately during ACTH administration, but again progressed as soon as the drug was withdrawn.

Just before topical cortisone therapy was begun on April 5, 1950, the patient complained of severe pain and photophobia. Examination revealed moderate circumcorneal injection and intense corneal bedewing, with a heavy ingrowth of deep vessels invading the whole cornea. There was marked wrinkling of Descemet's membrane. Cortisone, one drop every two hours, was prescribed.

On reëxamination at the end of one week there was less bedewing and less conjunctival injection and the patient stated that the pain and discomfort had disappeared after three days of therapy. At the end of 10 days, there was no bedewing and only a minimal injection. By three weeks the eye was white, the corneal vessels were less engorged, but there was no change in the wrinkling of Descemet's zone.

The drops were reduced from every two hours to four times daily. After eight weeks on this dosage, there was still complete subjective relief. By this time the corneal vessels were markedly attentuated and there was no wrinkling of Descemet's zone. Treatment is still being continued.

CASE 6

Postoperative striate keratitis. M. T., a white woman, aged 66 years, had a cataract extraction of the left eye, in December, 1949. One month later she developed a postoperative striate keratitis that continued active despite fever therapy and antibiotics. The presenting complaint on admission to the hospital, April 21, 1950, was moderate pain of the left eye.

General physical examination was negative except for some arteriosclerosis and a hypertension of 182/90 mm. Hg.

Ophthalmic examination revealed definite circumcorneal injection. The lower two thirds of the cornea showed bedewing with moderate stromal infiltration. There was deep neovascularization extending three mm. to six mm. into the cornea at many areas. The lower half of the endothelium was covered with small, mostly fresh, keratic precipitates. The aqueous showed a few circulating cells. A thin cyclitic membrane was present.

Initial laboratory studies were: R.B.C., 4.2 million; hemoglobin, 12.9 gm.; W.B.C., 5,500, with 62 polymorphonuclears, 30 leukocytes, three monocytes, one basophil, four eosinophils; urinalysis, normal; Kline exclusion test, negative; direct eosinophil count, 147. During hospitalization there was no significant change in either the direct eosinophil count or the white blood count.

Cortisone, one drop every 30 minutes during the waking period, was started April 21st. Eighteen hours later the cornea was free of edema and there was considerably less engorgement of the corneal vessels. Conjunctival injection had been reduced at least 50 percent. Pain was gone. The clearing continued and, when the patient was discharged from the hospital on April 30th, there was only a mild amount of corneal stippling. The corneal vessels were less engorged, the keratic precipitates had thinned, and there were no cells in the anterior chamber.

At home the cortisone was continued every hour for 11 days and then every two hours up to the present time. When last examined on June 8th, the eye appeared grossly clear. There was marked attenuation of the corneal vessels with still fewer precipitates on the endothelium and the aqueous was free of cells.

CASE 7

Phlyctenular keratoconjunctivitis. H. K., a white man, aged 42 years, had first seen us in July, 1949, complaining of redness of the left eye, accompanied by photophobia and tearing of three months' duration. There was a two-plus reaction to a skin test of 0.01 dilution of old tuberculin. Although he was started on a course of old-tuberculin desensitization, there was no improvement. Just prior to cortisone treatment the patient had a moderate-sized phlyctenule at the limbus at the 2-o'clock position with marked local injection.

Cortisone, one drop every three hours, was begun on March 28, 1950. At the end of two days the patient noted some symptomatic relief, there was less injection and the phlyctenule was definitely reduced in size. By April 1st there was just slight conjunctival injection at the 2- to-3 o'clock position.

When cortisone was stopped April 14th, the patient had no subjective complaints, the conjunctiva was clear, and the phlyctenule had completely disappeared. During the past two months, there has been no recurrence.

CASE 8

Phlyctenular keratoconjunctivitis. R. S., a colored woman, aged 26 years, complained of recurrent redness and pain of the right eye for six months. She showed a four-plus reaction to 0.001 old tuberculin and was started on a desensitization program one month prior to local cortisone therapy. There was no improvement.

Examination on April 21st revealed three small phlyctenules at the 8-, 9-, and 2-o'clock positions, with moderate local injection.

Cortisone was prescribed that day, one drop every two hours, and on reëxamination one week later, there was improvement in the marginal lesions. By May 12th the eye was completely clear, no signs of the phlyctenules remaining. The dosage was then reduced to four times a day for two weeks. The old-tuberculin desensitization program is being continued.

CASE 9

Bilateral tuberculous keratitis. O. W., a white woman, aged 59 years, had a chronically progressive, bilateral keratitis of 17 years' duration with periods of acute exacerbation despite intensive local therapy and a long course of old-tuberculin desensitization. The patient complained of pain and photophobia of five years' duration.

On examination there was moderate conjunctival injection of both eyes with scarring and superficial vascularization in the lower two thirds of each cornea.

Cortisone, one drop every hour, was begun on May 11th. At the end of 24 hours, the patient noted complete relief of pain and much less photophobia. The drops were reduced to every two hours for one day and then to every three hours.

Over a three-week period the conjunctival injection became markedly diminished, the corneal vascularization was reduced, and photophobia entirely disappeared. For the first time in five years the patient was entirely comfortable. Not only is this improvement being maintained under continued cortisone administration, but it appears at this time that the corneal scars are thinning.

CASE 10

Acne rosacea keratitis. G. P., a white woman, aged 36 years, had recurrent attacks of acne rosacea keratitis over a seven-year period. Two weeks prior to examination on May 21st, the patient again developed a "painful and red" eye.

Examination revealed considerable marginal corneal vascularization of the right eye, especially in the lower one third. Mild conjunctival injection was present and there were scattered, small, punctate stains on the cornea. An invasive, vascularized lesion, extending about three mm. into the cornea, was noted at the 7-o'clock position. The advancing portion of this took a fluorescein stain. There was an occasional cell in the anterior chamber of the right eye. The left eye showed some corneal vessels and old vascularized marginal scars.

Cortisone, one drop every two hours, was begun. One week later the patient volunteered that, after two days of therapy, the eye felt "less inflamed" and that, after three days, the eye felt "normal." Subjective relief in prior attacks had required one to three months. The eye showed no conjunctival injection and the stain in front of the invasive lesion had disappeared. A few punctate staining areas remained.

One week later even these had disappeared and the vessels in the limbal lesion were much smaller. Cortisone was reduced to four times a day and continued for two weeks.

CASE 11

Dendritic keratitis. E. W., a white man, aged 39 years, was first seen April 4th complaining of a foreign-body sensation in the left eye of four days' duration. On examination a large, central dendritic ulcer was found.

Cortisone, one drop every 30 minutes during the waking period, was begun. At the end of 24 hours there was little objective change, but the patient stated the eye was "less irritable."

There was less conjunctival reaction at the end of 48 hours, but still no change in the ulcer. The patient noted some "scratching" but his chief complaint now was blurred vision. After four days of treatment the ulcer remained essentially the same.

Aureomycin drops were then added to the treatment, being given on alternate hours with the cortisone. After six days of this therapy there was no significant improvement, and the ulcer was cauterized with tincture of iodine. It is interesting to note that this patient had a similar ulcer in the same eye in 1947, which on cauterization with iodine healed completely in three days.

CASE 12

Dendritic keratitis. I. K., a white woman, aged 34 years, was first seen on May 4th, complaining of a painful red eye of three-weeks' duration. Examination revealed moderate swelling of the right eyelids with injection of the bulbar conjunctiva. The cornea showed a large, dendritic lesion surrounded by considerable bedewing and deep stromal stippling.

Cortisone, one drop every 30 minutes, was begun the same day. There was alleviation of pain and photophobia within three hours.

Examination in 24 hours revealed marked diminution of lid edema but the dendritic figure was still present, though surrounded by less bedewing. There was no essential change at the end of four days of treatment and cortisone was then discontinued. The lesion was cauterized with iodine and the patient placed on aureomycin drops. Improvement was gradual but slow, five weeks being required for complete healing.

CASE 13

Acute marginal corneal ulcer. E. L., a white man, aged 37 years, was first seen on April 18th. For 24 hours he had complained of pain in the right eye. Examination revealed moderate edema of the right upper and lower lids and a marginal corneal ulcer, approximately one mm. in size, at the 8-o'clock position. The bulbar conjunctiva around the ulcer was hyperemic and chemotic. A small, tender, right preauricular gland was noted.

He was placed on cortisone, one drop every 30 minutes. At the end of 24 hours, there was less pain and the ulcer appeared smaller in size. In 48

hours the ulcer was healed and the conjunctival injection was subsiding. The preauricular gland was still slightly tender. On the fourth day, the drops were discontinued when the eye appeared entirely normal. There has been no recurrence in six weeks.

CASE 14

Trophic corneal ulcer. H. J., a white woman, aged 70 years, was first seen on March 4th with a history of a red, slightly painful eye for the previous five months. She had been under treatment by several doctors but the vision had failed progressively during the interval.

When seen by us, there was slight bulbar injection and a moderately dense scar over the inferior third of the cornea. When seen 11 days later she stated that the eye had been quite painful for 24 hours. There was a deep stain over the central part of the corneal scar with moderate conjunctival injection. Culture showed coagulase-negative Staph. aureus.

She was started on cortisone, one drop every hour. One day later the patient reported relief of pain after four or five drops. There were no changes in the objective findings. Over a 14-day period there was gradual healing of the trophic ulcer.

Cortisone was discontinued and at the end of three days there was again a breakdown of corneal epithelium as evidenced by two small staining areas. Despite the resumption of cortisone therapy, the ulcer progressed and the drops were discontinued at the end of six more days. Under vitamin therapy and sulfacetamide drops the ulcer healed in one week.

CASE 15

Trophic corneal ulcer. C. H., a white man, aged 65 years, was first seen April 4th with the complaint of pain and redness of the left eye of 10 days' duration. There was a past history of an ulcer of the left eye, 12 years previously.

Examination revealed a deep corneal excavation at the 3-o'clock position, only a portion of which took a fluorescein stain. From this an area of superficial stain extended upward and nasally.

Cortisone, one drop every 30 minutes, was begun and, at the end of 24 hours, there was much relief of pain. The trophic ulcer appeared about the same, but the area of superficial stain was greatly reduced in size. By the second day the corneal ulcer took less stain but the small superficial lesion remained unchanged.

The degree of improvement was not great although the ulcer became somewhat smaller during the six days the patient continued on cortisone. A small, superficial stain persisted at the 11-o'clock position after cortisone was discontinued. Further treatment, which included penicillin drops, aureomycin drops, and later pressure dressings with sulfacetamide ointment and supplementary vitamin therapy failed to bring about complete healing.

CASE 16

Fuchs's epithelial dystrophy. H. S., a white man, aged 55 years, was first seen on May 8, 1950. He gave a history of tearing, irritation, and loss of vision in the right eye over the previous 10 months.

Examination revealed central corneal bedewing with dense striate scarring in Descemet's zone. Three small epithelial blebs were present. The corneal periphery was clear. The left cornea showed early endothelial changes. His best corrected vision was: O.D., light perception; O.S., 20/40.

He received cortisone, one drop every hour, for one week and every two hours for four additional weeks. There was less tearing and no significant irritation after two days of therapy. During cortisone therapy there was a little less bedewing with transient disappearance of the blebs and slight peripheral shrinking of the lesion. No definite improvement occurred in Descemet's zone.

When cortisone was discontinued, the patient was placed on topical testosterone and observations made over a two-week period have shown a definite decrease in size and severity of the dystrophic lesion. Topical testosterone is being continued.

CASE 17

Vernal conjunctivitis. W. S., a white boy, aged 15 years, was first seen on April 12, 1950. He gave a nine-month history of burning, tearing, and photophobia of both eyes. Previous treatment had consisted of benadryl drops and oral antihistaminics without improvement.

On examination each upper lid revealed large, cobblestone papillas covered with a stringy, gray discharge. The lower palpebral conjunctivas showed only mild hyperemia and two or three small follicles.

He was started on cortisone, one drop every 30 minutes. At the end of three days there was diminution of tearing and photophobia and the papillas were slightly more pale and flat. The drops were then reduced to every hour. After 15 days, there was no further objective or subjective change and the cortisone was discontinued.

CASE 18

Vernal conjunctivitis. N. C., a white man, aged 19 years, had previously been hospitalized from March 13th to April 1st for ACTH therapy. Under this treatment there was marked improvement, with the large papillas shrinking at least 75 percent. At the time of his discharge he had no subjective complaints. By April 27th, there was regression of the lesions to almost the pretreatment level and return of itching and discharge.

Cortisone drops instilled in each eye every three hours gave relief of itching for only two days. During one week of treatment the lesions showed further progression and subjective symptoms again returned.

CASE 19

Chronic sarcoid iridocyclitis with secondary keratitis. J. F., a white man, aged 29 years, had been hospitalized in January, 1949, for iridocyclitis of the right eye. Chest X-ray studies showed findings typical of sarcoidosis and this diagnosis was confirmed by lymph-node biopsy. Treatment with calciferol and later parenteral streptomycin failed to arrest the process. On April 5, 1950, the patient returned to the Eye Clinic requesting enucleation of the painful left eye.

Examination revealed moderate circumcorneal injection. There was calcification and band-shaped degeneration of the cornea with only the upper and lower portions remaining clear. Through these a few cells could be seen in the anterior chamber.

The patient was started on cortisone, every hour, and at the end of the first 24 hours he was free of pain with definitely less conjunctival injection. The latter entirely disappeared at the end of one week and then only an occasional cell could be seen in the anterior chamber.

The aqueous was free of cells on May 24th and the band keratitis showed some clearing. Vessels in this were now less engorged. The drops were reduced to every three hours and are still being continued.

CASE 20

Acute iritis. R. B., a Negro, aged 56 years, was first seen April 10th, at which time he complained of a deep pain of the right eye of one week's duration.

Examination revealed moderate circumcorneal injection, some wrinkling of Descemet's membrane, and a fine cellular deposit on the posterior cornea. The aqueous showed a three-plus flare and two-plus cells.

Atropine and one injection of five-million units of typhoid-H antigen, hot compresses, and salicylates failed to improve the condition in two days. In fact, he became worse, as evidenced by the addition of a fibrin-coagulum to the cells in the anterior chamber. He was then admitted to the hospital April 12th.

General physical examination was negative except for the eye condition and some dental foci of infection. Routine laboratory studies were negative. Frequent eosinophil and white blood counts were not done on this patient.

Topical cortisone was administered, one drop every 15 minutes during the day and every hour during the night. In this case one-percent atropine, previously used, was continued, one drop, three times a day.

At the end of four hours the coagulum was almost completely gone and the patient was free of pain. After 24 hours there was no coagulum and only one-plus cells with no flare.

At the end of two days there was no injection; slitlamp examination revealed slight wrinkling of Descemet's membrane and only a few cells in the aqueous. In another 24 hours the eye was completely clear except for an occasional pigmented cell.

At this time the drops were reduced to every hour during the day and twice during the night. This treatment was continued for six more days, during which time the dental foci were removed.

When discharged April 22nd, the eye was unchanged. On examination one month later the eye was still clear and even the pigmented cells in the aqueous had disappeared.

CASE 21

Acute iritis. M. F., a white woman, aged 64 years, complained of tearing and redness of the right eye with mild pain and photophobia when first seen on May 9, 1950. She gave a history of an attack of iritis in the right eye three years previously.

Examination revealed moderate ciliary injection, fine cellular deposits on the posterior cornea, and one-plus cells in the aqueous together with a fine fibrin mesh.

Cortisone, one drop every 30 minutes, was prescribed. At the end of 24 hours the fibrin mesh had completely disappeared and fewer cells were seen in the aqueous. The ciliary injection had decreased, and mild photophobia had disappeared.

After three days, the aqueous was clear and no circumcorneal injection was present. The drops were reduced to every three hours for seven more days. When checked four weeks later, there had been no recurrence.

CASE 22

Acute iritis. R. T., a white man, aged 61 years, was first seen on May 11th. His only complaint was that of a little conjunctival redness. Although during the past 10 years he had experienced numerous attacks of iritis, our initial examination revealed no signs of intraocular inflammation. On the following day he complained of mild photophobia and now there was more bulbar conjunctival injection and a few cells in the anterior chamber.

He was started on cortisone, one drop every 30 minutes. One day later he showed one-plus cells. Three days later a coagulum had formed, covering the whole anterior lens capsule. Cortisone was discontinued, and homatropine, hot compresses, and salicylates were prescribed. The iritis responded to three days of this therapy.

CASE 23

Acute iritis with secondary glaucoma. V. B., a white man, aged 26 years, was first seen in our clinic on June 7, 1950. His presenting complaint was pain in the left eye of three days' duration. Since March, 1949, he had suffered from recurrent attacks of iritis that had been controlled by atropine and fever therapy.

Examination revealed a moderately severe circumcorneal injection. The cornea showed bedewing

of such a degree that the aqueous could not be examined but cellular debris was noted on the endothelium. Intraocular pressure was O.D., 23 mm. Hg; O.S., 40 mm. Hg (Schiøtz).

He was started on cortisone, one drop every 30 minutes. During this attack the patient had used just one drop of atropine the night before the examination and for this study he was told to discontinue the atropine. At the end of 24 hours he experienced less pain and photophobia. The conjunctival injection was diminished, there was no bedewing, and two-plus cells but no flare could now be seen in the aqueous. Intraocular pressure was 23 mm. Hg.

After three days, he was entirely free of pain and photophobia. The cornea was clear except for some cellular deposits on the endothelium and only a few cells were present in the aqueous. Intraocular pressure was 15 mm. Hg. Cortisone was reduced to every hour. When last examined, on the fifth day, the eye was entirely clear except for an occasional cell in the anterior chamber and a few residual precipitates on the endothelium.

CASE 24

Acute iritis with secondary glaucoma. C. K., a white man, aged 39 years, was referred to us for hormonal treatment of an acute plastic iritis with secondary glaucoma which had failed to respond to fever therapy.

Examination revealed moderate circumcorneal injection. The cornea showed marked bedewing and it was impossible to see any details of the anterior chamber. Intraocular pressure (Schiøtz) was 48 mm. Hg.

Cortisone, one drop every 15 minutes, was started and the patient was held in the clinic for observation.

At the end of one hour he stated that his eye "felt better." The tension was still 44 mm. Hg and there was no objective change. At the end of three and a half hours the bedewing was a little less and the tension was 40 mm. Hg. Many fine cells were now visible in the anterior chamber.

At the end of six and a half hours, the tension had fallen to 35 mm. Hg, and the patient was sent home to use the drops every hour during the night.

When examined the next morning the cornea again showed marked bedewing and the tension had returned to 48 mm. Hg. No change occurred when the drops were continued day and night at 15-minute intervals for another 24 hours. The patient was then admitted to the hospital for parenteral cortisone therapy.

Four hours after his first 50-mg. injection, the tension had fallen to 23 mm. Hg and all bedewing had disappeared. The eye cleared completely with five days of parenteral cortisone therapy.

DISCUSSION

The present study has demonstrated that the topical application of cortisone is effective in resolving certain inflammatory lesions of the anterior segment of the eye. It has proven effective in two cases of keratitis profunda and two cases of superficial keratitis, all of nonspecific etiology.

Of particular interest is the observation that topical cortisone appears to be of great value in controlling acute exacerbations of such lesions as acne rosacea keratitis, tuberculous keratitis, and phlyctenular keratitis, which previously have been relatively refractory to treatment.

It is also of note that one case of postoperative keratitis responded favorably and that another was relieved of all subjective symptoms.

Two patients with dendritic keratitis and two with trophic ulcers also had relief of subjective symptoms but in none of these cases did the corneal lesion heal completely during cortisone therapy. That the dendritic ulcer did not respond to cortisone is not surprising in view of the fact that it is a lesion of probable viral origin and diseases of this etiology, in general, have been unresponsive to ACTH and cortisone. The trophic ulcer is a lesion commonly considered to be due to disturbed corneal nutrition and as such one would not expect cortisone to be effective.

One previous clinical report[7] has indicated that ACTH delayed healing of surgical wounds and it is possible that the application of cortisone to open corneal lesions may retard healing. However, since two cases of superficial keratitis and one severe case of acute marginal ulcer healed completely, it cannot categorically be stated that cortisone delays healing of corneal lesions and further observations are necessary. It may be shown in the future that the etiology of the lesion will be the determining factor in whether or not healing occurs with local cortisone therapy.

In the patients with corneal lesions, one of the outstanding features was the rapid relief of pain and photophobia. This was noted, moreover, in the patients who later showed no definite objective improvement.

Our clinical studies have failed to show that this results from any measurable amount of corneal anesthesia. It is possible that more precise laboratory methods might demonstrate that some anesthesia does occur.

At the present time, it appears that this favorable effect of topical cortisone is, in part, a reflection of its direct action on the inflammatory process. Early relief of pain from parenteral ACTH and cortisone has been demonstrated by many observers in the treatment of a variety of diseases.

One patient we have recently observed following eye surgery was refractory to codeine, but had early and sustained relief of pain following 75 mg. of parenteral cortisone. Whether a similar physiologic action occurs in peripheral sensory nerves from topical cortisone remains undetermined.

Two cases of vernal conjunctivitis failed to have a significant response to topical cortisone. That these drugs are effective in such cases is evidenced by the marked improvement that occurred in one of these patients while receiving parenteral ACTH. It may be possible to explain the failure on the inability of the local cortisone to penetrate adequately exudate and redundant tissue to reach the primary pathologic process in the deeper layers.

Since four of our six cases of acute iritis responded to topical therapy, it appears that cortisone can penetrate the cornea in amounts sufficient to influence favorably some cases of iritis. There are many technical problems involved in making quantitative determinations of cortisone in small amounts of body fluids, such as aqueous, but this determination is desirable to establish securely the validity of the above observation. In acute iritis, except possibly for the milder forms, the beneficial effect of topical cortisone may be only of academic interest. In such cases it may be preferable to use the parenteral mode of administration, because here the response is rapid and the duration of treatment relatively short.

In chronic iridocyclitis, where excellent therapeutic results have been obtained during either ACTH or parenteral cortisone administration, topical cortisone may be of great value in preventing the relapses which so commonly occur. Investigation along this line is in progress.

Baker and Castor[8] have shown atrophy of skin with involution of hair follicles in experimental animals receiving percutaneous concentrated adrenocortical extract. This is an important observation and must be borne in mind in the clinical use of local cortisone. In the present study, however, there is yet no evidence that cortisone in the quantities used has been harmful to ocular tissues.

The maximum amount of cortisone instilled in the eye during a 24-hour period was approximately 15 mg. (Case 20) and the average for this series approximated seven mg. It is reasonable to feel that only a portion of this could have been absorbed. It should be pointed out that cortisone is one of the adrenal steroids constantly present in body fluids.

Topical cortisone surely must add to the local level but, on theoretical grounds alone, if the normal tissue level is not greatly exceeded, the drug might be administered for indefinite periods without danger. It is possible that in certain ocular lesions, there is an absolute or relative cortisone deficiency, and if such is true, local cortisone here would be a form of replacement therapy.

Since cortisone has been beneficial it is not unreasonable to postulate that other steroids of different physiologic behavior, when applied to eye lesions, might produce favorable changes in keeping with their known physiologic effect. Thus, the use of estrogen and testosterone in the eye might result in certain reparative processes, as has been observed in human senile skin by Goldzieher and associates[9] using topical estrogen. This is currently being studied.

The merits of topical cortisone are apparent. At the present time, the perenteral method of therapy is best used during hospitalization, where the patient can be care-

fully observed and where the necessary precautionary laboratory studies can be performed. Furthermore, complications and undesirable physiologic side effects may be encountered with the parenteral form of therapy. This is especially true if treatment is prolonged.

Topical cortisone obviates these difficulties. Laboratory studies in two patients have indicated no general systemic effect from topical use. None would be expected, since at most, only minute quantities of the drug could be absorbed in the blood stream.

Investigations are currently being made with other preparations of topical cortisone to determine the most effective form for this mode of therapy.

Summary

1. The results of topical cortisone in the treatment of 24 cases of anterior-segment eye disease have been reported.

2. It has proven effective in the following: nonspecific keratitis profunda, nonspecific superficial keratitis, postoperative striate keratitis, phlyctenular keratoconjunctivitis, tuberculous keratitis, acne rosacea keratitis, and certain cases of acute iritis. One case of chronic sarcoid iridocyclitis showed a complete remission during therapy.

3. In this series it was ineffective in vernal conjunctivitis, dendritic keratitis, trophic ulcer, and Fuchs's epithelial dystrophy.

4. To date no injurious effects have been noted in patients receiving local cortisone.

5. This form of therapy is simple and effective in selected ocular lesions. It appears to offer much in the treatment of certain lesions heretofore relatively refractory to other forms of therapy.

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CORTISONE IN THE TREATMENT OF PHLYCTENULAR KERATOCONJUNCTIVITIS

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Phlyctenular keratoconjunctivitis is still an important cause of corneal scarring and visual loss, particularly among the Indians and Eskimos of Alaska.[1] The ordinary forms of treatment, including a wide variety of antiseptics and antibiotics, and topical applications of calomel, must be considered extremely unsatisfactory.

The available evidence indicates that the disease is a bacterial allergy, most often involving products of the tubercle bacillus. It is most damaging in childhood, and corneal scars and vascularization are ordinarily the result of recurrent acute attacks.

Prophylaxis rests necessarily on protection of the child from exposure to tuberculosis, and great strides have already been made along this line, particularly in the continental United States.

In areas such as Alaska, however, where public health and general medical care are not so highly developed, tuberculosis and its satellite phlyctenulosis are still major problems, and, pending control of the tuberculosis, a means of aborting acute attacks of the ocular lesions, and thus preventing corneal cicatrization, is desperately needed.

The fact that cortisone has proven to be effective in a number of diseases in which allergic phenomena are prominent[2] suggested the possibility that it might serve to block the allergic mechanism which leads to the production of phlyctenules. In a series of 14 cases of phlyctenulosis observed at Mt. Edgecumbe, Alaska, and in private practice in California, Merck cortisone acetate (saline suspension 25 mg./cc.), diluted 1:2 with normal saline, was used topically in 12 cases, and the undiluted suspension was given subconjunctivally in a dosage of 0.1 cc. in two cases.

REPORT OF CASES

The essential information on the results obtained in this series is listed in Table 1, but the following cases are worthy of special mention:

Case 1. M. J., a 10-year-old Japanese-American school girl, exhibited an acute phlyctenulosis of both eyes of short duration. Cortisone drops were instilled in the right eye every hour during the day, and the left eye was left untreated as a control. In 24 hours the attack in the right eye had been aborted while that in the left continued unchanged.

After two days the cortisone was started in the left eye and 24 hours later it also had become clear. Cortisone was continued in both eyes four times daily for a week and was then discontinued. There has been no recurrence over a two months' observation period.

Case 2. E. B., a 20-year-old woman college student with bilateral phlyctenulosis and severe pannus and scarring, had had chronic activity with recurrent exacerbations over a two-year period. At the time she was first seen both eyes had been active, with numerous phlyctenules, for three days. The right eye was treated with cortisone drops hourly

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TABLE 1

TREATMENT OF PHLYCTENULAR KERATOCONJUNCTIVITIS WITH CORTISONE

Case No.	Age (Yrs.)	Sex	Activity	Duration	Cortisone Therapy	Result
1. M. J.	10	F.		Intermittent activity, 4 yrs; present attack, 5 days	Topical q hr. during day for 2 days; then q.i.d. 7 days	Complete remission in 48 hours
2. E. B.	20	F.		Intermittent activity, 2 yrs; present attack, 3 days	Topical q hr. during day for 2 days; then q.i.d. 14 days	Complete remission in 24 hrs; no recurrence in 2 months' observation period
3. H. P.	10	F.		Intermittent activity, with incomplete remissions, 2 years	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 48 hrs; no recurrence in 3 weeks' observation period
4. N. L.	36	F.		Intermittent activity, with incomplete remissions, 5 years	Topical q hr. during day for 48 hrs; then q.i.d. 48 hours	Complete remission in 24 hrs; no recurrence in 3 weeks' observation period
5. R. T.	4	M.		Intermittent activity of both eyes, 1 yr; present attack, several days	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 24 hrs; no recurrence in 3 weeks' observation period
6. H. A.	17	F.		Continuous activity for 3 months	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 48 hours
7. P. O.	18	M. 1st attack		First known attack 4-7 days duration when first observed	Subconjunctival injection, 0.1 cc.	Complete remission in 48 hours
		2nd attack		Observed at onset	Subconjunctival injection, 0.1 cc.	Complete remission in 48 hours
8. M. D.	16	F. 1st attack		Many attacks from infancy; minimal lesion of unknown duration	1 drop cortisone only	Complete remission in 24 hours
		2nd attack		Sudden flare-up in same location observed on 2nd day; treated from 3rd day	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 48 hours
9. M. C.	19	F.		Continuous activity for 1 year	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 96 hours
10. W. G.	4	M.		Repeated attacks in past year	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 48 hours
11. H. D.	32	M.		First known attack; 2 days' activity when first observed	Subconjunctival injection, 0.1 cc., near phlyctenule	Complete remission in 24 hours
12. J. B.	42	F.		Many attacks left eye in childhood; present attack of long duration	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 6 days
13. R. A. G.	3½	F.		First known attack; 2 days' duration when first observed	Topical application q.i.d. 4 days	Complete remission in 48 hours
14. C. W.	10	F.		Both eyes, 2 months' continuous activity	Topical q hr. during day for 2 days; then q.i.d. 2 days	Complete remission in 48 hours

for two days. At the end of this period the treated eye was in complete remission while the untreated eye remained unchanged.

Use of cortisone in the second eye led to rapid healing, the eye becoming white in less than 48 hours. Cortisone drops, four times daily, were continued over a two months' observation period with no evidence of recurrence of activity.

Case 7. P. O., an 18-year-old Eskimo boy, had a single phlyctenule at the limbus of the right eye at the 8-o'clock position which responded rapidly to subconjunctival injection of 0.1 cc. of cortisone.

One week later he developed a single active phlyctenule at the limbus at the 10-o'clock position in the other eye. This is turn was treated with cortisone drops every hour for two days and healed rapidly. The second phlyctenule was observed and treated on the day of its onset, before ulceration had begun, and healed without passing through the usual evolutionary stages of the lesion.

Case 10. C. W., a four-year-old Eskimo child with active tuberculosis of the spine, had had repeated attacks of phlyctenulosis with unusually severe photophobia and blepharospasm. At the time treatment was begun the child kept his head buried in his pillow and was totally uncoöperative. The day after treatment was begun his photophobia had disappeared, the eye was white, and the child had become playful and coöperative.

Case 12. J. B., a 42-year-old Indian housewife, had suffered many attacks of phlyctenulosis in the left eye since childhood. These episodes had left the cornea of the left eye badly scarred (table 1).

For the two months preceding her visit to us the right eye had been red, painful, and photophobic. There was an active corneal phlyctenule at the 1-o'clock position and a confluence of three corneal phlyctenules at the 3- to 5-o'clock position, resulting in a large shallow ulcer.

Topical instillations of cortisone every hour during the day resulted in alleviation of the tearing, photophobia, blepharospasm, and much of the redness in 48 hours. Continued use of the cortisone four times daily for four more days resulted in complete remission on the sixth day.

Discussion

The prompt response of phlyctenular keratoconjunctivitis to cortisone in this small series adds further support to the theory of the allergic nature of the phlyctenule and suggests that a reliable way may have been found to abort acute attacks. Systemic administration would seem to be unnecessary, even in the more severe cases, and subconjunctival injections and instillations into the conjunctival sac appeared to be equally effective.

The medication is nonirritating and well tolerated; no instances of allergic sensitization to the hormone have been reported, and topical use precludes the danger of systemic toxicity. Nor is the cost a major factor in the treatment of phlyctenulosis in view of the small amount required.

The difficulty of interpreting results of therapy in a disease such as phlyctenulosis, which occurs characteristically in acute, self-limited attacks, is well recognized. In this series, however, the uniform and rapid inactivation of the disease would seem to remove all reasonable doubt as to the relation of the cortisone to the results obtained.

In Cases 1 and 2, control eyes were available and in both cases the treated eye responded promptly to therapy while the untreated eye continued its activity. While it is obvious that the phlyctenulosis itself is not cured by topical cortisone therapy, it seems to us to be the most promising method of aborting acute attacks yet offered.

Summary and Conclusions

Fourteen cases of active phlyctenular keratoconjunctivitis, varying in severity from mild to extremely severe forms of the disease, responded dramatically to the use of

cortisone acetate by instillation or subconjunctival injection. In three cases recurrences of activity after cessation of medication yielded promptly to readministration of the drug.

Addendum

Since this article was submitted for publication, we have treated 12 additional cases of phlyctenular keratoconjunctivitis with instillations of cortisone acetate. In 11 of the 12 the activity was arrested within 48 hours and to date there have been no relapses.

The remaining patient, an 18-year-old Alaskan Indian boy with a history of recurrent phlyctenulosis since the age of four years, had severely scarred and vascularized corneas with a vision of: R.E., 20/200; L.E., 20/800. At the time of treatment with cortisone he had a subacute keratoconjunctivitis of the right eye without active phlyctenules and treatment failed to effect significant change over a six-day period. Cultures revealed a heavy growth of Staphylococcus aureus and therapy with terramycin resulted in rapid relief of symptoms.

In a personal communication to the senior author, Dr. Ludwig von Sallmann reported that he had treated nine patients with phlyctenulosis and that all had benefited from local cortisone therapy. Four had relapses which responded satisfactorily to renewal of therapy.

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This study would not have been possible without the coöperation of the following individuals: C. E. Albrecht, M.D., Commissioner of Health for Alaska; Grace Field, M.D., Tuberculosis Control Division, Alaska Department of Health; Miss Bertha Bloomer, R.N., Alaska Department of Health; Mrs. Magnild Bogue, R.N., Alaska Department of Health; Robert Shuler, M.D., Alaska Native Service, medical director, Mt. Edgecumbe Medical Center; Philip Moore, M.D., director, Orthopedic Hospital, Mt. Edgecombe Medical Center; Miss Zena Kiziuta, bacteriologist, Mt. Edgecumbe Medical Center.

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Ophthalmic Miniature

Koch, while at Alexandria, Egypt, investigating the cholera epidemic, examined the secretion from fifty cases of conjunctivitis, which included two forms. One of the forms of conjunctivitis, which runs a very severe course, he asserts to be due to the presence of a bacterium which closely resembles the gonococcus, and is probably identical with it. The other, a very much less severe process, in which a *constant* condition was the presence of a very small bacillus in the pus corpuscles. The latter is probably the same form that I have described.

John Elmer Weeks,
Archives of Ophthalmology, 1886.

LOCAL AND SYSTEMIC CORTISONE IN OCULAR DISEASE*

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It has been shown by several investigators (Olson, *et al.;* McLean; McLean and Gordon; Blake and Fasanella; Mann and Marksson; Woods; Henderson and Hollenhorst) that cortisone as well as ACTH is helpful in the therapy of various forms of ocular disease. The effective mechanism is not known, although many possibilities have been and are being investigated. The therapeutic schedule can be worked out only by actual trial in clinical cases.

Most of the reported studies to date have dealt with the systemic use of these endocrine materials. Cortisone can act directly on tissues and has, therefore, been the subject of studies for its local effects. It may be applied directly to the eye, as has been reported by Olson *et al.*, Woods, McLean, Henderson and Hollenhorst, and others.

Local therapy has many advantages. It obviates the undesirable effects that might follow systemic therapy. It reduces the cost to the individual patient, and the cost of the cortisone for systemic administration is often prohibitive. Therefore, clinical study was attempted in an effort to evaluate the use of the drug by topical, subconjunctival, and retrobulbar administration.

METHOD

The drug was administered chiefly by the subconjunctival route, 0.05 cc. of cortisone acetate suspension, approximately 1.25 mg., being injected daily for three days. A rest period of two days was allowed, and therapy repeated for three days, as the progress of the case indicated. Cortisone acetate was also used in suspensions diluted 1:4 and 1:8 with normal saline, the drops being instilled every hour in the involved eye. In some cases, cortisone was injected retrobulbarly, 50 mg., in two cc. with 0.5 cc. of four-percent procaine in the fluid. One hundred and forty-two eyes treated by one or all of these methods are included in this analysis. Only eyes that have been observed for a minimum of three months are included in this study. In 10 of the cases in which local therapy had failed, systemic therapy was subsequently tried. Systemic therapy consisted of 100 mg. every eight hours for three doses; 100 mg. every 12 hours for two doses; and then 100 mg. daily until therapy was stopped.

TISSUE TOLERANCE TO LOCAL ADMINISTRATION

Reactions to the drug administered by these methods was unremarkable, with rare exceptions. The injection of cortisone subconjunctivally was followed in most instances by a small area of subconjunctival hemorrhage at the site. Within 12 to 24 hours a yellowish-white cortisone deposit could be seen beneath the conjunctiva. This did not completely absorb in most instances for five to seven days after the injection. Transient edema of the conjunctiva also occurred. There was no complaint of unusual pain or discomfort following any injection of cortisone subconjunctivally. Injections were always preceded by the instillation of two drops of 0.5-percent tetracaine hydrochloride.

There was no undue reaction nor subjective complaint following the use of diluted cortisone suspension as drops.

Following each retrobulbar injection of cortisone there was noticeable edema of the

* From the Research and Clinical Departments of the Wills Eye Hospital. Presented before the Section of Ophthalmology, College of Physicians of Philadelphia, October 19, 1950. The cortisone used in this study was purchased from Merck & Company, Rahway, New Jersey.

lids and conjunctiva. In one patient there was severe pain behind and over the eye immediately following the injection. He showed limitation of rotation of the extraocular muscles and there was definite redness of the lids, as well as edema.

The appearance of the eye was not unlike that seen with a retrobulbar abscess, but the patient showed no temperature elevation nor was there any local rise in temperature. The sedimentation rate, and white blood cell and differential count remained normal. Ice compresses were applied to the eye, and by the fifth day the eye was entirely normal in appearance and function.

Usually, following the retrobulbar injection, the edema of the lids and conjunctiva disappeared within 48 to 96 hours, and appeared to subside more rapidly when ice compresses were applied as a routine procedure. No influence on the total eosinophil count, blood sugar, and blood pressure was noted following retrobulbar or subconjunctival injections.

Concurrent therapy

In all of the cases, where indicated, hot compresses and mydriatics were used along with the cortisone. In the majority of cases fever therapy and/or various antibiotics had been tried before resorting to cortisone therapy. All the patients had been submitted to a diagnostic survey before therapy was instituted. This applied particularly to the cases of uveitis.

Studies in uveitis included sedimentation rate, complete blood count with differential count, serology including Kahn and Wassermann reactions, brucellosis and typhoid agglutinations and Weil procedure, also Mantoux, Lygranum, and brucellergin skin tests, chest, dental, and sinus X-ray studies, and other X-ray studies as indicated.

Criteria of evaluation

Those cases which showed changes from severe inflammation to little or no signs of inflammation (that is, from marked conjunctival injection, pericorneal injection with one-plus to three-plus aqueous beam to slight or no conjunctival injection, and no or questionable aqueous beam within five to six days after onset of therapy) were considered to be improved.

This improvement had to continue and progress to complete quieting of the inflammatory process or the case was considered to be relapsed.

Relapsed was the description for all cases that improved within four or five days after the onset of treatment, but failed to go on to complete regression of signs and symptoms.

Unimproved was reserved for those cases which did not respond significantly to the use of cortisone.

Results

The following summarizes the number of eyes and results obtained in the various ocular conditions treated in this series (tables 1, 2, and 3).

It is evident from a study of these tables that cases of allergic conjunctivitis, vernal conjunctivitis, corneal ulceration, dendritic keratitis, chemical keratitis, nonluetic atypical interstitial keratitis, marginal ulcers, superficial keratitis, and sclerosing keratitis improved with local cortisone. The signs and symptoms of these conditions decreased in severity following local application of this drug.

Therapy did not result in complete quieting of the condition in all of the above-mentioned cases, however. Relapses were frequent. All of the cases of nonluetic interstitial keratitis relapsed in spite of the fact that therapy was continued. Nonspecific atypical interstitial keratitis responded well and rapidly to subconjunctival injections of cortisone. However, relapses occurred in each case. When cortisone solution was used in drop form the eyes again quieted but when the drops were stopped, flare-ups occurred.

Sclerosing keratitis responded immediately to one series of three injections, but relapsed

TABLE 1

OCULAR CONDITIONS TREATED WITH CORTISONE

Diagnosis	Etiology	Subconjunctival	Mode of Therapy		Retrobulbar	No. of Eyes	Result		
			Drops	Systemic			Improved	Unimproved	Relapsed
Blepharitis	Staph?		5			5	3		2
	Seborrhea?								
	Allergy?								
Blepharoconjunc.	Atropine	5	5			5	4	1	
Ocular pemphigus	?	2	2			2		2	
Erythema multiforme	Allergy?	2	2			2		2	
Vernal conjunc.	Allergy?		6			6	3	3	
Episcleritis	Allergy?	2				2	2		
Marginal corneal ulcers	Allergy?	3				3	3		
Deep corneal ulcers	?	3				3	2	1	
Phyctenular keratitis	Allergy	1				1		1	
Dendritic keratitis	Herpes simplex	4				4	3	1	
Superficial keratitis	Virus?					2	1		1
	Allergy?		2						
Sclerosing keratitis	Allergy?	1				1	1		
Chemical keratitis	Lime	2				2	2		
Interstitial keratitis	Congenital lues	4				4		4	
Interstitial keratitis	Nonluetic	3				3			3
Corneal dystrophy	?	1				1		1	
Anterior uveitis	Undiagnosed	49				49	39	7	3
	Postoperative	6				6	4		2
	Traumatic	3	1			3	1	2	
	Sarcoid	3				3		3	
Diffuse uveitis	Herpes zoster	3	2	2		3	1		2
	Phacoanaphylaxis	2				2	1	1	
	Sympathetic ophthalmia	2				2	2		
	Vogt-Koyanagi syndrome	2		2		2		2	
	Harada disease	2		2		2		2	
Posterior uveitis	Undiagnosed	16		2	4	16	4	12	
Retrobulbar neuritis	Multiple sclerosis?				4	4		3	1
Macular degeneration	Juvenile			1	1	2		2	
Macular degeneration	Senile			1	1	2		2	
RESULTS OF CASES TREATED WITH CORTISONE									
No. of Eyes Treated 142		121	25	10	10		76	52	14

when treatment was stopped. Following three more subconjunctival injections, the condition has remained quiet for six months.

Dendritic keratitis in three eyes showed improvement. The eyes became quiet and the dendritic figures were seen to regress slowly over a period of days, remaining quiet beneath the closed epithelium. It was not possible to eliminate time as a factor here.

It is apparent that nonspecific anterior

TABLE 2

CONDITIONS IMPROVED BY LOCAL CORTISONE

1. Infections
   - Bacterial
     - Blepharitis
   - Viral
     - Dendritic keratitis?
     - Herpes zoster
2. Possible allergic states
   - Drug sensitivity
   - Vernal conjunctivitis
   - Episcleritis
   - Marginal corneal ulcers
   - Superficial keratitis
   - Sclerosing keratitis
   - Nonluetic interstitial keratitis
   - Uveitis
3. Chemical burns
   - Lime

TABLE 3

CONDITIONS NOT IMPROVED BY LOCAL CORTISONE

1. Possible allergic states
   - Ocular pemphigus
   - Erythema multiforme
   - Phlyctenular keratitis
   - Luetic interstitial keratitis
2. Unknown etiology
   - Corneal dystrophy
   - Macular degenerations
   - Retrobulbar neuritis

uveitis can be treated beneficially in most cases with cortisone with the dosage and method described in this study. Anterior uveitis following surgery also responded well to subconjunctival cortisone. In six eyes secondary glaucoma, associated with the uveitis, disappeared as the inflammation subsided.

There were only two cases of phacoanaphylaxis included in this study. One of them was treated unsuccessfully. The other quieted quickly with local cortisone therapy after having shown no improvement following vigorous therapy with fever, desensitization to lens protein, antihistaminics, salicylates, and local cycloplegics.

The results of subconjunctival cortisone in posterior uveitis were unsatisfactory. The majority failed to respond to this hormone when applied subconjunctivally. It is interesting to note that two cases of posterior uveitis treated by retrobulbar injection also showed no significant improvement. These cases improved subsequently with systemic cortisone. Four other cases, two treated subconjunctivally and two retrobulbarly, showed improvement while on local therapy, but therapy was continued intermittently over a long period of time, so that the response may have been one of time rather than of specification medication.

Failure with cortisone

No improvement was obtained in cases of ocular pemphigus, erythema multiforme, corneal dystrophy, congenital luetic interstitial keratitis, uveitis due to Boeck's sarcoid, Vogt-Koyanagi syndrome, and Harada's disease. In a case of proven Boeck's sarcoid, injection of cortisone directly into enlarged lymph nodes produced no detectable clinical or histologic changes in the node.

No improvement was noted in cases of juvenile and senile macular degeneration following local or systemic therapy. Two cases of retrobulbar neuritis showed temporary questionable improvement after one to three retrobulbar injections. Because of the known vagaries of this disease, the results were not sufficiently convincing to include under specifically benefited cases. The case of Vogt-Koyanagi syndrome was treated originally with systemic cortisone with no improvement and then, on a later admission, with subconjunctival cortisone unsuccessfully. The same sequence of therapy led to no improvement in the case of Harada's disease.

A noteworthy observation was made in a case of uveitis with concurrent drug allergies. Local cortisone therapy had failed to alter the course of a recurrent nonspecific iritis in which there was an atropine, scopolamine, and homatropine sensitivity. However, it was noted that a combination of adrenalin, cocaine, and atropine could be injected subconjunctivally in this eye with no allergic response when cortisone was also present subconjunctivally.

Consideration of mode of administration

Of all the cases treated with retrobulbar cortisone; namely, posterior uveitis, retrobulbar neuritis, and macular degeneration, only two showed some questionable improvement. It appears that this is not an especially effective route for therapy of posterior segment lesions. Because of the marked reaction of edema following retrobulbar injections such therapy has not been repeated more than two or three times in any one eye.

It may be that the greater benefit of systemic over retrobulbar cortisone was due to the fact that the therapy could be continued by the systemic route, and was not continued for a sufficient length of time when the retrobulbar method was used. The results also imply that intratissue penetration was greater following systemic therapy.

Cortisone suspensions as eye drops were used alone, in association with, or following subconjunctival injections of cortisone. Twenty-five cases were treated in this manner. These included four cases of anterior uveitis, scleritis with keratitis, deep keratitis, anterior uveitis following surgery, and one of atypical interstitial keratitis. These cases improved following treatment with cortisone subconjunctivally; then relapsed

and improved again when cortisone suspensions as drops were started.

Topical cortisone as the only therapy was helpful in allergic conjunctivitis, vernal conjunctivitis, and in superficial punctate keratitis. In no case in which subconjunctival injections were unsuccessful were subsequent topical cortisone drops beneficial. In two cases of herpes zoster anterior uveitis slight improvement occurred following subconjunctival injection. Much greater improvement occurred with systemic cortisone.

Discussion

It is important to note the benefit from cortisone administered as drops, by subconjunctival injection, retrobulbar injection, and by the systemic route in these various types of ocular disease. It would be even more important to know the mechanism by which cortisone produces its effect. This study contributes very little toward explaining the modus operandi of cortisone in ocular disease, except to suggest that the systemic effects (namely: the retention of sodium chloride, the excretion of potassium, the storage of glycogen, the gluconeogenesis, the depression of eosinophils, and so forth) are probably not operative in bringing about the clinical improvement that occurs with local cortisone therapy.

The drug is apparently not helpful in degenerative conditions such as dystrophy and macular degeneration. Its chief benefit seems to be in cases with active inflammatory processes. This indicates that the cortisone breaks the inflammatory reaction at some point, perhaps by decreasing permeability of vessels and membranes, perhaps by a direct effect on the vessel tone, perhaps by detoxifying the inflammatory toxins that produce the reaction. In an effort to clarify this problem, experimental studies are underway.

Experimental studies

Many problems present themselves in considering the mode of beneficial action of cortisone. The ones considered in this study are listed in Table 4.

TABLE 4

Experimental studies with local cortisone

1. Penetration
   a. Drops
   b. Subconjunctival
   c. Retrobulbar
2. Tolerance of tissues
   a. Subconjunctival
   b. Retrobulbar
   c. Intraocular
3. Wound healing
   a. Epithelial
   b. Stromal
4. Inflammation
   a. Irritants
   b. Chemical burns
   c. Infection
      1. Bacterial (subconjunctival and drops)
      2. Virus (subconjunctival and drops)
   d. Antibiotic properties
   e. Allergic reactions
   f. Influence on spreading factor
5. Permeability
   a. Fluorescein penetration
6. Intraocular pressure
7. Influence on pupil

Penetration of locally applied cortisone

Drops of cortisone solution, diluted 1:8 or 1:4 in normal saline and zephiran and undiluted, were applied repeatedly to the conjunctival cul-de-sac of normal rabbit eyes—that is, two drops every five minutes for six doses—and aqueous specimens were withdrawn at 30, 60, 90, 120, 240, 360 minutes after the application of the first drop. Before obtaining aqueous specimens the eyes were flushed with normal saline and two drops of tetracaine hydrochloride were instilled.

Subconjunctival injections of 0.05 cc. of undiluted cortisone (1.25 mg.) were made into normal rabbit eyes and aqueous specimens withdrawn as described above at the same time interval.

Retrobulbar injections were made with 1.0 cc. of cortisone (25 mg.) in normal rabbits and aqueous and a few vitreous-humor specimens were obtained at the intervals as already described.

TABLE 5

AQUEOUS HUMOR CONCENTRATIONS OF LOCALLY APPLIED CORTISONE

Method	Time of Withdrawal of Aqueous Specimen after Application (Minutes)						
	30	60	90	120	180	240	360
Normal Aqueous	trace " "						
Topical Drops Cortisone acetate diluted 1 to 4 in normal saline	trace +1 +1 +1 +1 +1 +1	+1 trace +1	+1 trace +1	+1	+3	+1	+1
Topical Drops Cortisone acetate diluted 1 to 4 in zephiran 1:3000	+1 +1 +1 +1 +1	+3 +3	+1 +2 +3			+2 +3 +3	+1 +1
Subconjunctival 1.25 mg./injection		+2 +2 +2 +2		+1 +2 trace +1	+1 +2	+3 +3	+3 +3
Retrobulbar 25 mg./injection			+1	+1	+3 +3	+1 +1	+2 +1 +1 +2

+1—barely perceptible color change with addition of reagent
+2—definite red color with addition of reagent
+3—intense red color with addition of reagent

Specimens of each time interval were deproteinized and tested for cortisone content using alkaline 2,3,5-triphenyl tetrazolium chloride as the reagent.*

The results are shown in Table 5. It should be noted that normal aqueous and vitreous show a trace color reaction with this test. Therefore, a color reaction of one-plus or greater was considered as showing the presence of cortisone in these specimens.

It is evident that all methods of application result in penetration into the aqueous humor. Subconjunctival injection produced slightly better penetration than drop therapy with cortisone acetate suspension in saline. However, cortisone acetate suspended in zephiran allowed equal penetration values. Even retrobulbar injections produced definitely detectable levels in the aqueous humor. The cortisone was still detectable in the aqueous humor for six hours after a single subconjunctival injection and for at least four hours after repeated zephiran vehicle drop therapy.

The superior results in clinical cases with subconjunctival administration over topical therapy with cortisone acetate suspension in saline may be due to the greater intraocular penetration. If this is the sole reason for the clinical superiority of the subconjunc-

* While a variety of naturally occurring reducing substances give a red color with this reagent, its use here is justified on the grounds that the control specimens gave only traces of color. Among the adrenocortical compounds, only those having either the alpha ketol or the di-hydroxyacetone type of side chain would give positive tests. These tests were carried out by Dr. John J. Schneider of the Department of Experimental Medicine, Jefferson Medical College, to whom we are indeed grateful.

tival route over topical therapy, perhaps topical therapy with cortisone in zephiran or other wetting agents would prove as efficacious as subconjunctival injection.

The normal vitreous humor also shows a positive reaction ranging from a trace to plus-one value with this test for alpha-ketol groups.

After retrobulbar injection, however, definite vitreous levels of cortisone could be obtained at two hours and six hours. Apparently, retrobulbarly administered cortisone can penetrate into the posterior segment. If this observation is applicable to the human eye, it makes it difficult to explain the apparently unsatisfactory clinical results with retrobulbar cortisone on the basis of penetration.

Tissue tolerance

In order to determine the reaction of tissues to the injection of cortisone, this hormone was injected into the subconjunctival and retrobulbar tissues of seven rabbits. Three-tenths cc. of cortisone was injected subconjunctivally just above the cornea in the right eye and 0.5 cc. of the material was injected into the retrobulbar region of the left eye.

These rabbits were killed and biopsies were taken of the regions into which the cortisone was injected. The biopsies were obtained at the following time intervals after the injection of cortisone: One hour, six hours, 24 hours, six days, two weeks, one month, and two months.

Paraffin sections were made of these biopsies and they were stained with hematoxylin and eosin.

Also biopsies were obtained from normal rabbit conjunctiva and retrobulbar tissues, and from conjunctiva and retrobulbar tissue into which normal saline had been injected six and 24 hours previously.

In the subconjunctival tissue which was obtained six hours following the injection of cortisone, an infiltration of polymorphonuclear leukocytes was seen—this infiltration was not marked and similar to that seen after the injection of normal saline. Subconjunctival hemorrhage could be seen in the one-hour and six-hour biopsies. Hemorrhage and polymorphonuclear leukocytes were not present in the biopsy which had been obtained on the sixth day. All of the other biopsies revealed no deviation from the normal.

From this one may infer that the injection of cortisone into the conjunctiva of the rabbit causes only a local infiltration of polymorphonuclear leukocytes with slight subconjunctival hemorrhage that disappeared before the sixth day. No local tissue reaction was seen following the injection of cortisone into the retrobulbar tissues of the rabbit.

Three rabbit eyes were injected directly into the anterior chamber with 0.05 cc. of cortisone acetate (1.25 mg.). No permanent pathologic change was noted in the anterior segment except for a mild iritis and pericorneal injection that persisted for three to six hours after injection.

Intravitreal injection of 0.05 cc. of cortisone-acetate suspension in three rabbit eyes produced no changes other than that seen after normal saline injections.

Wound healing

There is evidence in the literature that cortisone interferes with wound healing. Ragan, *et al.*, demonstrated an inhibitory effect of cortisone on granulation tissue in surface wounds on the ears of six rabbits. Studies by Spain, *et al.*, also demonstrated that cortisone inhibits formation of granulation tissue but does not interfere with granulation tissue already present.

To investigate these observations in ocular wounds, standard abrasions of the epithelium by a method previously described were made in both eyes of six rabbits and standard 5.0-mm. diameter stromal wounds with a guarded trephine (one that could penetrate only 0.4 mm.) were made in both eyes of another six rabbits.

Cortisone acetate, 1.25 mg., was injected subconjunctivally into one eye of each rab-

bit daily for seven days and normal saline into the control eyes.

A definite difference in healing of the epithelial wound was noted. All control eyes showed no staining by the third to fifth day. Of the cortisone-treated epithelial abrasions, only one was healed by the fifth day. The others did not heal for six to 10 days. No infections occurred.

The stromal wounds were not covered by epithelium quite as rapidly on the treated side as on the untreated, and by histologic study of paraffin sections a definitely less amount of fibroblastic tissue was found in the treated than in the control eyes.

Repetition of some experiments was made using instillation of cortisone-acetate suspension containing 6.0 mg. per cc. Drops of this were instilled hourly for 10 hours for five consecutive days in one eye of each rabbit. The control eyes received drops of normal saline.

Epithelial regeneration was complete in the control eyes by the third to the fifth day and in the treated eyes by the fourth to the sixth day. One of the treated eyes showed secondary infection and was not healed by the tenth day.

Stromal wounds showed no gross difference in healing rate between healed and control eyes, but histologically there was less granulation tissue in the treated eyes. However, the difference was not as marked as in subconjunctivally treated series.

These data for ocular tissue merely confirm those already reported in the literature for other tissues. When cortisone is present in sufficient concentration, it will interfere with epithelial and stromal wound healing. This should be kept in mind in the therapy of freshly operated cases. According to Spain, *et al.*, cortisone does not interfere with fibroblastic tissue already formed.

It would appear then that this hormone should not be used immediately after intraocular surgery has been performed but may be used after the wound has had a few days in which to heal. It should be stressed, however, that various concentrations of cortisone may have a variable effect on wound healing. It is conceivable that in low concentrations cortisone might not deter wound healing.

Inflammation

Woods and Jones and Meyer have reported that local and systemic cortisone will block the inflammatory effects of irritants such as glycerin, jequirity, and alkalis. On the other hand, Spain and co-workers were unable to demonstrate any effect of cortisone on the production of an acute inflammatory exudate due to turpentine.

To study this problem further, the following experiments were performed:

Alkali burns of the cornea. Topical cortisone-acetate suspension, used hourly for 10 hours for seven days, and daily subconjunctival injections of 1.25 mg. failed to influence the degree of opacification and vascularization of the cornea following application of 0.01 cc. of concentrated sodium hydroxide solution to the corneal center and intralamellar injection. Four treated and control eyes were used for each type of therapy and type of application of alkali.

The failure of cortisone to be helpful in these lesions may be due to the severity of the alkali burns used. Any slight effect would be masked with such toxic lesions.

Experimental bacterial infections. Standard corneal infections were produced with Aerobacter aerogenes, Bacillus coli, and Proteus vulgaris.*

An 18-hour broth culture of Aerobacter aerogenes was centrifuged, the supernatant fluid was poured off, and sterile saline solution added to the packed organisms. The suspension of organisms in saline was centrifuged and the supernatant fluid replaced with fresh saline and the organisms were resuspended. The gross estimate of 600 million organisms per cc. was determined by comparison with a nephilometer.

Under general anesthesia, veterinary nem-

* Organisms were supplied by Dr. T. G. Anderson, Temple University Medical School.

butal (12 gm./lb.) intravenously and local tetracaine hydrochloride (0.5 percent), an intralamellar corneal injection of the organisms was made until a bleb was visible in the pupillary area of the cornea. Approximately 0.02 cc. of the saline suspension of Aerobacter aerogenes organisms was injected using a 1.0 cc. tuberculin syringe and a 26-gauge needle.

This procedure was repeated with Bacillus coli and Proteus vulgaris. These had approximately 800 million organisms per cc.

These eyes were divided into control and treated eyes. Therapy was started immediately. Cortisone drops diluted 1:4 with normal saline were instilled hourly for 10 hours for 10 days. Subconjunctival injections of cortisone, 0.05 cc. (1.25 mg.) were made daily for 10 days. Six rabbits were used for each organism and each form of therapy. The eyes were evaluated daily.

At no time was a difference seen between the drop-treated and the control eyes of the eyes infected with Aerobacter aerogenes and B. coli. Slightly less severe lesions were observed in the drop-treated Proteus vulgaris eyes by the seventh day. The difference persisted until the end of the experimental period (two weeks).

Subconjunctivally treated eyes showed a definitely less severe lesion with all organisms than the control eyes. The difference in severity first became apparent on the third or fourth day and continued throughout the experimental period for all organisms tried.

Experimental viral infections. This experiment was repeated using a standard herpes-simplex lesion of the cornea. Under 0.5-percent topical tetracaine hydrochloride anesthesia, three vertical superficial incisions were made into the temporal half of the cornea to avoid difficulty with the nictitating membrane. A drop of the 0.5-percent gelatin buffered saline suspension of the herpes-simplex virus was instilled into both the right and left eye.

Approximately one hour after inoculation of the virus, treatments were instituted in the right eye only. In every instance the left eye served as the control eye.

Eight rabbits were used for evaluation of topical therapy and eight for the subconjunctival route. Drops (1:4) were instilled every hour for 10 hours and then ointment consisting of 1.0 cc. of cortisone acetate in 4.0 gm. of anhydrous lanolin base. Drops were given every hour for four hours on the second day and ointment every three hours for four times the rest of that day. Therapy was done hourly for nine times on the third day and ointment at the end of the day. Four hourly treatments with drops and one with ointment were made on the fourth day. The same schedule was followed on the fifth and sixth days.

Subconjunctival injections were given daily for six days.

Results. No beneficial effect in the experimental dendritic lesions could be seen in the eyes treated with drops and ointment or in those treated with subconjunctival cortisone. Actually, the treated eyes were a trifle more severely involved than the controls.

It is interesting to note the effectiveness of subconjunctival cortisone versus standard bacterial corneal infections and also the superiority of daily subconjunctival therapy over repeated topical therapy. The superiority of subconjunctival therapy over topical in the dosages used in this study were also noted in the previously mentioned clinical cases.

Local cortisone was ineffective in the inflammatory process induced by herpes virus experimentally. It is interesting to speculate about this difference in effectiveness between experimental bacterial and virus infections. Perhaps cortisone has an antibacterial and not an antiviral effect. This was tested by the serial dilution method versus several organisms; for example, Streptococci viridans, B. coli, and Staph. aureus 209. It was found that cortisone had a definite antibacterial effect in concentration above 6.0 mg./cc.

It must be remembered that cortisone acetate as used has as a preservative benzyl

alcohol in 1.5 percent. This also has a definite antibacterial effect and may account for most of the antibacterial cortisone effect in these experiments.

Allergic reactions. Woods's experimental studies have shown that local and systemic cortisone will temporarily block allergic ocular reactions induced by introduction of horse serum, bacteria, and bacterial proteins. However, since cortisone blocks inflammatory reactions due to irritants, glycerin, alkalis, and those due to bacterial infection it probably is not the interference with the antigen-antibody reaction that is responsible for its clinical effect.

Antihyaluronidase activity. We know from the experiments of Opsahl, Seifert, and others that cortisone interferes with the spreading factor, hyaluronidase. Perhaps some or a great deal of the local benefit in inflammatory reaction caused by irritants and bacteria is due to this feature and this should be further investigated. However if the spreading factor was of sole importance there should have been some alteration in the cortisone-treated experimental virus lesions.

Permeability

Because so many of the aspects of cortisone effect could be explained by a reduction of vessel permeability, a series of rabbits were injected intravenously with 3.0 cc. of 10-percent sodium fluorescein solution. The time of appearance of the dye into the anterior chamber was determined in normal eyes without cortisone, with subconjunctival cortisone (1.25 mg.), with topical cortisone (two drops every five minutes for six doses), and with cortisone (1.25 mg.) injected directly into the anterior chamber. No delay in appearance of fluorescein was noted in the cortisone-treated eyes. Cortisone apparently does not influence the blood-aqueous barrier for molecules with the size and charge of fluorescein.

Miscellaneous

During these studies it was noted that local cortisone had no effect on intraocular pressure or pupillary phenomena of normal eyes.

Summary

It is evident from these studies and others that:

1. Subconjunctival administered cortisone may penetrate into the intraocular fluids in detectable quantities. Topically and retrobulbarly administered cortisone also produced detectable amounts in the intraocular fluids of rabbit eyes. A wetting-agent vehicle allowed greater penetration following drop application than a saline vehicle.

2. Cortisone, when injected in the dosage used in this study into conjunctiva, retrobulbar tissue, and intraocularly, produced no irreparable damage.

3. Cortisone interferes with fibroblast formation in the corneal stroma and with epithelial regeneration. Topical application did this less so than subconjunctival injection.

4. Cortisone reduces inflammatory reactions not only of toxic substances and allergic reactions but also of experimental bacterial invasion, but not that of experimental virus lesions.

5. Cortisone may have a specific antibacterial effect but most of this is probably due to its preservative benzyl alcohol.

6. Local cortisone failed to decrease the permeability of the blood-aqueous barrier for fluorescein.

This study does show that cortisone may be used as a solution for topical application diluted 1:4 with normal saline so that each cc. of solution contains approximately 6.0 mg. of cortisone.

It may be used by subconjunctival injection, with 0.05 cc. of cortisone solution containing 1.25 mg. of cortisone. Subconjunctival injections should be continued until the eye is either definitely quiet or until no further improvement occurs with continued treatment.

Relapses after subconjunctival therapy and systemic therapy can sometimes be prevented by subsequent topical therapy.

One must realize that a certain reaction will occur with any subconjunctival injection and that cortisone remains subconjunctivally as a yellowish mass which will disappear within five to seven days after the injection.

If retrobulbar cortisone is to be used, one should be prepared for unusual marked reactions of edema in occasional cases. The value of such form of therapy in retrobulbar neuritis and posterior uveitis is questionable.

Systemic cortisone would appear, from this study, to have a greater effect in posterior uveitis than subconjunctival cortisone, and also in occasional cases of anterior uveitis. Wherever subconjunctival cortisone has failed, systemic cortisone may still be tried with some hope of benefit.

A definite number of cases improved only while cortisone was being administered and another group improved for a while on cortisone therapy, but subsequently failed to benefit from repeated and continued therapy. At the present time, there does not seem to be any method by which the permanency of cortisone therapy can be predicted.

Conclusions

1. Topical cortisone will improve blepharitis, allergic conjunctivitis, vernal conjunctivitis, episcleritis, and some cases of keratitis and anterior uveitis.

2. Subconjunctival cortisone is beneficial in cases of episcleritis, a variety of corneal inflammations, and anterior uveitis.

3. In some cases in which topical cortisone solution has been unsuccessful, benefit may be obtained by subconjunctival cortisone.

4. In cases in which subconjunctival cortisone has been unsuccessful for pathologic conditions of the anterior segment, systemic cortisone may be beneficial.

5. In posterior uveitis, systemic cortisone has a greater degree of success than subconjunctival cortisone.

6. Retrobulbar cortisone is not demonstratedly successful in macular degeneration and is of questionable value in posterior uveitis and retrobulbar neuritis.

7. A certain number of cases respond to cortisone therapy only as long as treatment continues.

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UNILATERAL EXOPHTHALMOS AS A FORERUNNER OF THYROTOXICOSIS

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Exophthalmos is a relatively frequent sign in thyrotoxic goiter, occurring in from 60 to 80 percent of cases.[1] The degree of exophthalmos may not be in proportion to the severity of the toxic symptoms, for the protrusion may be marked in the presence of few other signs.[2] Plummer states that five percent of exophthalmic goiters show a low basal-metabolic rate between plus 10 and plus 20 percent.[3]

The causes of unilateral exophthalmos are very numerous; for a comprehensive list reference is made to Spaeth's paper.[4] In a review of the etiology of 82 cases of unilateral exophthalmos, O'Brien and Leinfelder found two of these to have been caused by goiter.[5] However, unilateral exophthalmos is found in the course of thyrotoxic goiter in 10 to 20 percent of cases.[2]

It is not uncommon for exophthalmos to be the presenting feature in thyrotoxic goiter, but it is very unusual for exophthalmos to precede all clinical and laboratory manifestations of thyrotoxicosis.[6] A review of the literature reveals only eight reported cases of exophthalmos preceding a thyrotoxic condition, and two of these are doubtful. Dinsmore and Ruedemann describe a case wherein protrusion of the right eye preceded an elevated basal metabolic rate by approximately 18 months; the left eye subsequently protruded, also.[7]

Ellett[8] described two cases: In his first case, unilateral exophthalmos preceded symptoms by one year; while, in his second, an exploratory operation of the orbit revealed hypertrophied ocular muscles. This latter case may therefore have been of the mixed thyrotropic-thyrotoxic type because later the basal-metabolic rate rose to plus 46.

Covitz[6] described three cases: Two showed unilateral exophthalmos preceding toxic symptoms by 20 months and eight months respectively, and one exhibited a bilateral exophthalmos which was followed by toxic symptoms five months later.

Of the five cases presented by Kisner and Mahorner,[9] only two cases showed exophthalmos before symptoms. In one of these cases a basal-metabolic rate of plus 18 subsequently developed. Thyroidectomy was done and the exophthalmos progressed to such an extent that a Naffziger operation had to be performed. Hence the exophthalmos in this case may have been of the thyrotropic variety. The other case showed exophthalmos two months before the basal-metabolic rate rose to plus 35; thyroidectomy improved the condition.

Mulvany[10] divides the exophthalmos of hyperthyroidism into two main groups, thyrotoxic and thyrotropic. Thyrotoxic exophthalmos is caused by an overactive thyroid secreting an excess of thyroxin. The proptosis is the result of the increased tone of the smooth muscles (Müller's palpebral muscles, and Landstrom's muscles) working against weakened rectus muscles.

On the other hand, thyrotropic exophthalmos is produced by an excessive secretion of thyrotropic hormone by the pituitary in the presence of an excess of male sterones together with an insufficiency of thyroxin.

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The extraocular muscles are enormously increased in bulk by fibrosis, massive edema, and round-cell infiltration.

As a result, an increase of retrobulbar pressure and consequent proptosis of the eyeball occur. Edema of the lids and conjunctiva is the result of compression of the venous arcades at the base of the lids.[11]

Mann[12] thinks that thyrotoxic and thyrotropic exophthalmos can co-exist and overlap. To support her contention she describes 18 cases which she divides into three groups: (1) Those which have a primary deficiency of thyroxin with a compensatory excess of thyroxin followed by thyroid atrophy or removal, and then (2) by an excess of thyrotropic hormone; (3) those showing an excess of thyroxin and thyrotropic hormone simultaneously.

Case Report

History. R. S., a white woman, aged 34 years, presented herself on December 22, 1934, because of prominence of the left eyeball for eight months and "pains in the left eye." About two months after noticing this prominence of the eye, a hysterectomy was performed and she was under the impression that subsequently the globe had receded somewhat, but not to its normal position. Five years previously she had had eclampsia.

Ocular examination. Visual acuity was: R.E., 20/30; L.E., 20/100, both correctible with weak minus lenses to 20/20. Exophthalmometry (Hertel): R.E., 16 mm.; L.E., 17 mm. at 101 mm. There was no abnormality of the lids or conjunctivas. No lid lag, no lid retraction, or any other signs of thyrotoxicosis were found.

The corneas, irises, media, and fundi showed no pathologic changes. Tension was normal. The eyes transilluminated well. No bruit was audible. Ocular movements were normal.

Muscle balance, by the screen and cover test, revealed an exophoria of one prism diopter for distance and two prism diopters for near. The near point of convergence was 90 mm., the upper limit of normal. Both eyes could easily be compressed into the orbits.

General physical examination. The basal-metabolic rate was consistently found to be within normal limits; there were neither tachycardia nor tremors. X-ray studies of the sinuses and orbits were not significant.

Course. In December, 1935, 20 months after exophthalmos was first noticed, the patient began to have tremors of her fingers. She became increasingly nervous and irritable and noticed a marked loss of weight. In January, 1936, due to weakness, she fell down stairs and noted a swelling of the neck on the following day. Her friends remarked that her left eye was then becoming more prominent.

On April 21, 1936, she was admitted to the hospital where a diagnosis of Graves's disease was made. Bilateral exophthalmos was then present as well as other positive thyrotoxic eye signs and moderate symmetrical enlargement of the thyroid. The basal-metabolic rate of plus 50 percent was reduced to 24 percent after iodine therapy. Subtotal thyroidectomy was performed and the pathologic study revealed a hyperplastic thyroid.

On December 14, 1936, the basal metabolic rate was still plus 29 percent, and the pulse rate was 96. On May 13, 1937, exophthalmometry (Hertel) showed: R.E., 18 mm.; L.E., 19 mm. at 101 mm. Lid lag and lid retraction were present, and the near point of convergence was 150 mm.

Comment

The ophthalmologist is frequently called upon to make the diagnosis of thyrotoxicosis, often in the presence of slight extraocular signs or symptoms. The presenting symptom may be proptosis, diplopia, tearing, or difficulty in reading. In the absence of ocular complaints, a suspicious sign such as lid lag, proptosis, the recent onset of convergence insufficiency, or the

weakness of a muscle may occasionally be discovered.

If the findings are bilateral and other physical signs of thyrotoxicosis are present, the diagnosis may be easily made and the patient may be referred to an internist for confirmation of the diagnosis and for treatment. However, should the presenting symptom be unilateral exophthalmos, and should there be slight or no other ocular or general physical signs or symptoms of thyrotoxicosis, it behooves the ophthalmologist to consider a host of other diseases.

Local ocular disease such as high myopia, glaucoma and buphthalmos, panophthalmitis, and coloboma of the choroid may be easily ruled out. The absence of recent trauma will negate a fracture of the orbit, the laceration of an extraocular muscle, foreign body in the orbit, or arteriovenous aneurysm.

The absence of signs of acute inflammation may rule out retrobulbar cellulitis and abscess, thrombophlebitis, cavernous-sinus thrombosis, erysipelas, and periostitis. Less acute inflammations will be more difficult to eliminate.

Primary tumors of the posterior segment of the eyeball and of the optic nerve have their characteristic findings. Mucocele, pyocele, cholesteatoma, as well as meningocele and meningo-encephalocele, can be discovered with the aid of X-ray studies. However, the presence of cysts and neoplasms of the orbit and adnexa may be more difficult to determine.

Thus the diagnosis of impending thyrotoxicosis on the basis of one sign, unilateral exophthalmos, is difficult as well as dangerous. That it may be an early sign, however, cannot be doubted. Moreover, the frequency of its occurrence cannot be accurately ascertained. Undoubtedly it is frequently missed.

The patient may not be aware of it nor present himself for examination until other signs manifest themselves. The degree of difference between the two eyes may be so small that the condition escapes notice at regular eye examinations. Therefore it may be assumed that exophthalmos, unilateral and bilateral, may precede thyrotoxicosis more often than is generally known.

Summary

1. Eight cases from the literature of exophthalmos preceding thyrotoxicosis are reviewed.

2. An additional case of unilateral exophthalmos preceding thyrotoxic symptoms and signs by 20 months is presented.

3. The difficulty and infrequency of such a diagnosis are stressed.

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PRACTICAL CONSIDERATIONS CONCERNING CHOICE OF OPERATION IN CONVERGENT SQUINT

EDWARD JACKSON MEMORIAL LECTURE*

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Edward Jackson was one of the giants of ophthalmology, and his influence will never be forgotten in our specialty. An able clinician, a frequent contributor to ophthalmic literature, an editor, a founder of the American Board of Ophthalmology, he contributed to every phase of ophthalmology. I am greatly honored to be invited to give a Jackson Memorial Lecture.

Although many methods have been devised for the examination and treatment of convergent squint, there are still unsolved problems. A few ophthalmologists, who have devoted most of their time to the study and treatment of heterophoria and heterotropia, have developed into specialists in the field. However, the majority of patients with muscle anomalies must continue to be cared for by the general practitioners of ophthalmology.

The discussion which follows is presented for such general practitioners of ophthalmology as a practical working outline which in my hands has served to give a higher percentage of good results than any method previously tried.

Considerations of binocular fixation and stereopsis, abnormal retinal correspondence, and orthoptic treatment are beyond the scope of this paper. These are important factors, but we are here concerned only with surgical treatment.

In surgical treatment the working principle should be to find out which muscles are overacting and which are underacting, and base the choice of operation on this finding. If the case is correctly analyzed and the right muscles are attacked surgically, the battle is half won.

Of course, even if the right muscles are operated on, the experience and judgment of the surgeon must dictate the extent of the operation. This discussion is largely a record of personal experience, but I should like to acknowledge my great debt to the late Dr. J. W. White, whose teachings are the basis of my ideas concerning convergent squint.

When a child with convergent squint is first examined, it is determined whether the squint is monocular or alternating in type. In all cases of monocular squint, after atropine refraction and prescription of glasses if indicated, occlusion of the fixing eye is advised, providing there is no organic lesion in the squinting eye.

If there is good coöperation, and treatment is begun early enough, the amblyopia can usually be overcome, and in many cases the squint will become alternating. Coöperation will often be lacking unless the great importance of the procedure is emphasized.

If there is a considerable degree of anisometropia, even if the amblyopia is overcome by occlusion, there is often a preference for fixation with the eye having the smaller refractive error. There are also a certain number of patients with monocular squint with amblyopia in whom, because of age, lack of coöperation, or organic disease, it is not possible to overcome the amblyopia.

MONOCULAR SQUINT

In monocular squint, operations are usually done on the squinting eye. One may recess the internal rectus muscle, resect the external rectus, or do the combined procedure. In all cases with a good near point—30 mm. or

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less—the internal rectus should be recessed, whether or not resection of the external rectus is done.

One may expect a relatively greater effect from the recession if there is a considerable accommodative element,* if the squint is greater for near than for distance, and, if, on exposing the muscle, it is found to be thick and strong or abnormal check ligaments are encountered.

These factors, as well as the amount of the angle of squint, determine whether or not resection of the external rectus is done at the same time, and how much resection to do. The amount of resection to be done depends also to some extent on the condition of the lateral rectus muscle when it is exposed. If the near point is remote, the internal rectus should not be recessed: resection of one or both external rectus muscles should be done.

If there is profound amblyopia and no possibility of binocular vision, one should aim at undercorrection. In general the surgery should be more conservative if there is a high degree of hypermetropia.

Alternating squint†

In the discussion which follows, the terms "strong" and "weak" are applied to various muscles to indicate the relative degree of their motility. It is recognized that when one speaks of apparent "strength" or "weakness" of a muscle, one may be referring to structural change, to abnormal check ligaments, to degree of innervation, or possibly even to a degree of secondary deviation, and that the terms should not be interpreted in a literal sense, since except in cases of actual paresis any of the extraocular muscles has far more actual strength than is required to rotate the eyeball.

Factors to be considered in the analysis and classification of alternating squint are:

1. Presence or absence of an accommodative element; that is, whether the angle of squint is less with glasses than without.
2. Near point of convergence.
3. Whether or not the squint is greater when the patient is fixing with one eye than with the other.
4. Presence or absence of limitation of abduction and comparative abduction power of the two lateral rectus muscles.
5. The angle of squint for distance and near.
6. Presence or absence of a vertical component.
7. Changes of fixation in various positions of gaze.

These factors may be considered in some detail.

1. *Presence or absence of an accommodative element.* In all cases in which there is hypermetropia of one diopter or more, glasses should be given a trial. Relatively weak glasses in some cases have a marked effect in reducing the angle of squint. One notes how much, if any, the angle of squint is reduced by glasses. Usually a few months are sufficient to determine the effect of glasses.

2. *Near point of convergence.* With both eyes open, a light or some small object is brought slowly toward the root of the nose. In some cases it can be noted that both eyes continue the convergence movement until the test object reaches the root of the nose. In this case the near point may be said to be unlimited. In other cases one eye or the other ceases the convergence movement when the test object is some distance from the root of the nose.

If the near point is unlimited when tested with both eyes open, it is of some importance to repeat the test, covering one eye. The examiner observes the screened eye, then notes at what point it ceases the convergence

* The term "accommodative element" is used in this discussion to refer to the effect of glasses. For instance, if in a given case the angle of squint is much less with glasses than without, there is said to be a large "accommodative element." The term is *not* used to refer to the fact that the squint is greater for near than for distance. If the latter is true it will be so stated in these terms.

† Under this heading will be considered spontaneous alternators, as well as cases in which alternation has been brought about by occlusion.

movement as the test object approaches the root of the nose. The test is then repeated, covering the other eye.

It will sometimes be noted that one eye ceases the convergence movement under cover at a greater distance from the root of the nose than does the other eye under the same conditions. This test may indicate that one medial rectus is stronger than the other, though dominance may affect the result in some cases.

3. *Whether or not the squint is greater fixing with one eye than the other.* The test is made both for distance and near. Estimation of the difference in angle of squint is made by means of the Hirschberg reflex.

4. *Presence or absence of limitation of abduction and comparative abduction power of the lateral rectus muscles.* When a test object is followed outward by the eye, one may note in some cases more or less limitation of motion. The test is made both binocularly and monocularly. If the lateral excursion is full, but coarse nystagmoid movements occur on attempted extreme lateral gaze, it may indicate some weakness of the lateral rectus. A comparison is made of the function of the two lateral rectus muscles.

5. *Angle of squint.* This is measured by means of the prism and cover test in the primary position for both distance and near, with and without glasses.

6. *Presence or absence of a vertical component.* Approximate determination of the vertical deviation, if any, is done by inspection of the eyes in the various positions of gaze, and, if necessary, by use of the prism and cover test.

7. *Changes of fixation in various positions of gaze.* In some cases of alternating convergent squint fixation is invariably with the right eye in the right field and with the left eye in the left field. This type will be called homonymous fixation. With this type of fixation, from a practical point of view the effect is that of an overaction of the medial recti, whether this be a primary or secondary deviation.

In some cases fixation is always with the right eye in the left field and with the left eye in the right field, hereinafter called crossed fixation.

In the case of crossed fixation the effect is that of underaction of the lateral recti. This may be due to weakness of the lateral recti or to excessively strong medial recti.

In still another group of cases, fixation is sometimes homonymous, sometimes crossed, often crossed in the central zone, homonymous to either side. This type of fixation suggests that there may be overaction of the medial recti combined with underaction of the lateral recti. One type of fixation or the other may be predominant.

Having the patient follow a light passed slowly from one side of the field to the other will sometimes give valuable information, in cases of homonymous fixation with apparent overaction of the medial recti, as to which is the stronger medial of the two.

If, for instance, with the right eye fixing a light in the right field, the light is moved slowly to the left, it can be observed in some cases that, when the fixing eye reaches the primary position, it suddenly shoots in and fixation is taken over with the left eye.

Then, with the left eye fixing a light in the left field, if the light is moved slowly to the right, the left eye may continue to hold fixation well past the primary position before it shoots in and fixation is taken over by the right eye. In this case the right medial rectus may be considered the stronger acting of the two.

Measurement of the squint by means of the prism and cover test in the six cardinal positions of gaze is a valuable diagnostic measure. I do not do it routinely because it is time consuming, and it may be neither easy nor accurate in the case of younger patients with limited powers of concentration.

Classification and Operative Treatment

In the following discussion emphasis is placed on the horizontally acting muscles. However, in cases which show a vertical

component, operation is done on vertically acting at the same time as on the horizontally acting muscles, or operation may be done in some cases only on the vertically acting muscles.

Not all cases of overaction of the inferior obliques require operation on these muscles. If the overaction is of moderate degree and only apparent on extreme adduction of the eye, no operation on the oblique muscles may be necessary.

In operation on the horizontally acting muscles, the goal of operation is to correct the convergence which is present with glasses, not without. This is no less true if only a relatively weak correction is worn, since in some cases glasses of only one or two diopters strength may have a marked effect in reducing the angle of squint.

I. Apparent overaction of the medial recti

The majority of alternating convergent squints fall into this group. There may or may not be an accommodative element. Fixation is homonymous. The near point is good to unlimited. The squint, as measured by the prism and cover test, is usually greater for near than for distance. The convergence may or may not be greater with one eye fixing than with the other. There may be little difference in the apparent overaction of the medial recti, or one may appear much more overactive than the other.

For operative treatment of this type of squint, I have had the best results with recession of both medial recti, recession of one medial rectus, recession of one medial rectus and resection of the lateral rectus of the other eye, and, in certain instances, operation for correction of the vertical component only.

In my experience, resection of the lateral rectus with recession of the medial rectus of the same eye, particularly if there is an appreciable accommodative element, has proven unsatisfactory. Although in some cases the cosmetic result may be fairly good, one sees too often after such an operation a residual esotropia for near, and an exotropia for distance, or a residual esotropia without glasses and an exotropia with glasses.

1. *Recession of both medial recti.* Theoretically, graduated bimedial recession should be suitable for most cases of this type, but from a practical standpoint it is technically very difficult actually to recess a muscle exactly 1, or 2, or 3 mm.

If a very small recession is attempted, there may be no effect at all. If a bimedial recession of 3 or 4 mm. is done in a small squint with a considerable accommodative element, the result may be an overcorrection and a remote near point. This is especially true if the patient does not fuse at the angle of squint. More boldness is permissible if there is fusion at the angle of squint.

The decision as to how much recession to do is also based on measurement of the squint over a period of time when glasses are worn. If the squint gradually becomes less over a period of time, less recession is called for. If there is no change in the squint over a period of time, a relatively larger recession is necessary. If there is considerable hypermetropia, a little overcorrection can be dealt with by reducing the strength of the glasses. If there is little or no hypermetropia, overcorrection is to be avoided if possible.

I have used bimedial recession for the following two groups of cases:

A. Esotropia of 30 to 40 diopters or more, no accommodative element and a good near point. Angle of squint greater for near than far.

B. Esotropia quite large, 50 or 60 diopters or more, with an accommodative element and an unlimited near point. Angle of squint greater for near than far.

2. *Recession of one medial rectus.* This operation is done, whether or not there is an accommodative element, in cases where one medial rectus is apparently stronger than the other, where the esotropia is slight and changes at times to an esophoria for distance, with a sharp inshoot for near of the

eye with the stronger medial rectus.

3. *Recession of one medial rectus and resection of the lateral rectus of the other eye.* This operation has proven satisfactory in squints up to 30 or 40 diopters in the ordinary case, and of even higher degree if the squint is much greater fixing with one eye than with the other. It is not indicated where the squint is small for distance and quite large for near. Here, bimedial recession is preferable.

A few typical cases in which this operation has proven satisfactory are:

A. A case with or without an accommodative element. Esotropia not markedly greater for near than for far. Esotropia greater with right eye fixing either for distance or near or both. Near point good.

When the near point is tested first with one eye and then the other eye screened and the right eye shows a poorer convergence under cover than the left, resection of the right lateral rectus and recession of the left medial rectus would be done.

If, in this type of case, the left eye were strongly dominant, one should be more conservative in the amount of resection, on account of the danger postoperatively of a secondary deviation of the right eye outward in looking to the right.

B. A case with or without an accommodative element. Esotropia no greater with one eye fixing than with the other, whether tested for distance or near. Near point good.

When the near point is tested first with one and then the other eye screened, the right eye shows a poorer convergence under cover than the left. In this case a resection of the right lateral rectus and recession of the left medial rectus would be done.

In these groups just discussed, a 4.0-mm. recession is usually done. The amount of resection is graded according to the degree of esotropia for distance, and also by the condition of the muscles when exposed.

An obviously thin, elastic lateral rectus calls for more resection for a given angle of squint, and, conversely, less resection is done for the same amount of esotropia if the lateral rectus is normal in appearance and does not stretch unduly.

Furthermore, if the medial rectus to be recessed appears excessively large and strong and inelastic, and abnormal check ligaments are encountered, more effect may be expected from the recession, and consequently less resection of the lateral rectus will be required.

In general, more effect may be expected from the recession in squints partly accommodative than in those with no accommodative element, and the resection is graded accordingly. This is also true if the esotropia is considerably greater for near than for distance. Dominance, as already mentioned, may also be a factor in determining the amount of resection.

4. *Correction of the vertical component only.* This is tried first in cases of overaction of one or both inferior oblique muscles when there is a large accommodative element, and the esotropia changes to an esophoria under some circumstances, usually for distance. If the handicap of the vertical element is eliminated, in many of these cases the esotropia or esophoria will be overcome without further surgery.

In many cases there may be a marked overaction of one inferior oblique with a slight overaction of the other. I believe it is of the greatest importance in such cases to operate on both inferior obliques. If only the stronger acting inferior oblique is operated on, in many cases one finds that a year or two later the unoperated muscle has become markedly overactive and has to be operated on.

II. Underaction of the lateral recti with little or no secondary contracture of the medial recti

In this type there is crossed fixation. Outward motion is somewhat defective, the eyes, in attempting extreme abduction, often make coarse nystagmoid motions. The near point is poor, often 40 or 50 mm. or more.

The esotropia, as measured by the prism and cover test, is very little different for distance and near. In some cases it is actually greater for distance than for near. There may or may not be an accommodative element. The esotropia may be greater with one eye fixing than with the other.

Since the primary manifestation is underaction of the lateral recti, the operation of choice is resection of both lateral recti. A larger resection may be done on one eye than on the other if one lateral rectus appears to be weaker than the other.

This is a relatively uncommon type of squint, but important to recognize, since recession of the medial recti in this type of case has proven very unsatisfactory. The most important point, in distinguishing this type of squint from a mild degree of strabismus fixus, is the remote near point.

It must be remembered that, when resection alone is done, the effect is much less than if a recession of the medial is done at the same time. In this type of case, the resection should seldom be less than 6 or 8 mm.; often it should be more than this.

III. Underaction of the lateral recti with contracture of the medial recti

This type is sometimes called strabismus fixus. It is usually apparent in early infancy. Fixation is crossed. The esotropia is little different distance and near. Glasses even of several diopters' strength have little or no effect. The near point is good. Outward motion is extremely poor. Neither eye may be able to rotate outward beyond the primary position.

In this type of squint the medial recti are unusually strong and inelastic, or held with strong check ligaments, giving rise to the inference, rightly or wrongly, that the lateral recti are paretic.

I believe recession of both medial recti is the operation of choice. This must usually be followed by the wearing of glasses with the nasal two fifths of each lens occluded, so as to break up crossed fixation and encourage external rotation.

Even so, it is often necessary later to resect one or both lateral recti. In these cases especially, operation should be done early in life, before too much contracture of the medial recti has taken place.

IV. Overaction of the medial recti combined with underaction of the lateral recti

In this type, fixation is sometimes homonymous, sometimes crossed, often crossed in the central zone and homonymous to the sides. In some cases fixation is predominantly crossed, in others predominantly homonymous.

As a rule, the esotropia is not greatly different for near than for distance. The near point is fair to good. The squint may be greater fixing with one eye than with the other. There may or may not be an accommodative element.

For this group of cases, I have employed resection and recession in one eye, recession of both medial recti, resection of both lateral recti, and recession of the stronger medial rectus combined with resection of the lateral rectus of the other eye.

Cases falling into this category and the surgical treatment recommended are illustrated in the following:

1. *Resection of lateral rectus, recession of medial rectus of the same eye.* No accommodative element. Good near point. Esotropia about the same distance and near.

2. *Resection of both lateral recti.* Angle of squint not large. May or may not be an accommodative element. Near point poor. Esotropia about the same for distance and near, or greater for distance than for near. Fixation predominantly crossed.

3. *Recession of the stronger medial rectus and resection of the lateral rectus of the other eye.* May or may not be an accommodative element. Good near point. Esotropia greater with one eye fixing than with the other.

4. *Recession of both medial recti.* Large angle of squint. Near point good. Fixation predominantly homonymous. May or may not be an accommodative element.

Summary

A brief summary is made of the generally accepted treatment of monocular convergent squint. For the analysis and classification of alternating convergent squint the following factors are considered of importance:

1. Presence or absence of an accommodative element; that is, whether the angle of squint is less with glasses than without.
2. Near point of convergence.
3. Whether or not the squint is greater when the patient is fixing with one eye than with the other.
4. Presence or absence of limitation of abduction and comparative abduction power of the two lateral rectus muscles.
5. The angle of squint for distance and near.
6. Presence of absence of a vertical component.
7. Changes of fixation in various positions of gaze.

From an analysis based on these points, alternating convergent squint is divided into four general groups:

A. Thqse in which there is apparent overaction of the medial recti.

B. Those in which there is apparent underaction of the lateral recti with little or no secondary contracture of the medial recti.

C. Those in which there is apparent underaction of the lateral recti with contracture of the medial recti.

D. Those in which there is apparent overaction of the medial recti combined with underaction of the lateral recti.

For the first group the operations recommended are recession of both medial recti, recession of one medial rectus, recession of one medial rectus and resection of the lateral rectus of the other eye, and correction of the vertical component only.

For the second group the operation recommended is resection of both lateral recti.

For the third group recession of both medial recti is recommended.

For the fourth group are recommended resection of the lateral rectus with recession of the medial rectus of the same eye, resection of both lateral recti, recession of the stronger medial rectus of one eye and resection of the lateral rectus of the other eye, and bimedial recession. Indications for these various operations are given in some detail.

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Ophthalmic Miniature

> The indication by which I knew the chloroform had taken effect consisted of a kind of dazzles, immediately followed by the appearance of a very beautiful and perfectly symmetrical Turk's-cap pattern formed by the intersection of a great many circles outside and tangent to the central one. . . . The whole exhibition lasted, as far as I could judge, hardly more than a few seconds.
>
> John Herschel, *Sensorial Vision*, 1867.

SOME OPHTHALMIC ASPECTS OF WAR PATHOLOGY

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Although it is well known that war periods influence the incidence of some diseases, a recent review of the ophthalmic aspects of this subject is still lacking, the main contributions being on eye injuries rather than on spontaneous pathologic conditions.

I thought, therefore, it would be interesting to summarize the principal data derived from our experiences during World War II and to add these data to those of World War I collected in the not too well-known volume edited by Axenfeld: ***Handbuch der aertzlichen Erfahrungen im Weltkriege 1914-18: V. Augenheilkunde.***

Conditions connected with war and post-war periods may cause, in civilians as in military personnel, the following main types of eye disturbances:

1. Eye diseases related to inadequate or ill-balanced diet.
2. Manifestations of a toxic origin, generally caused by using unsuitable substitutes or tainted food.
3. Infectious diseases of the eye which appear or spread more easily in wartime.
4. Ocular disturbances with a psychic or nervous background.
5. Eye changes caused by peculiar climatic or meteorologic conditions.

1. DIETARY DEFICIENCIES

1. Ocular manifestations undoubtedly due to a deficiency in the diet are, as everybody knows, hemeralopia, xerophthalmia, and keratomalacia, all of which are due to a lack of vitamin A. Although these conditions were frequently found among soldiers and civilians during and after World War I, especially in central Europe, they were reported much less frequently in World War II. Cases of hemeralopia were, however, seen in German concentration camps (Höttinger, et al.) and among war prisoners in Egypt (Borsello), but always on a limited scale. Some cases were also observed among civilians in Belgium (Weekers), in France (Guignot), in Austria (Rotter), and in Italy where the light sense deficiencies among the children of the poorest classes in Naples increased gradually during the war, reaching 51 percent in 1944 (Quagliariello).

In Italy, too, the number of cases with clinical ocular manifestations of a lack of vitamin A increased from 0.97 percent in 1939, to 3.88 percent in 1943 (Santoni and Bonavolontà). These findings were, however, far from being universal. I was unable to detect impairments of the light sense in Sardinia as were Grignolo and Della Casa in Rome.

A true epidemic of hemeralopia and xerophthalmia (over 1,000 cases) were recorded, however, among the civilian population in Greece (Charamis, Joannides, Spyratos) beginning in the summer of 1943. Ocular manifestations of vitamin-A deficiency reappeared on a large scale in China during the present civil war (Flowers).

Another important ophthalmic effect of the dietary restrictions connected with the war is optic neuropathy, mostly retrobulbar. Two aspects of this condition must be considered: the increase in cases of tobacco amblyopia among civilians and the appearance of optic neuropathies in prisoners-of-war and interned civilians.

Attention should be called to the fact that in World War I an increased incidence of toxic amblyopia was reported by Fehr, Sattler, Bachstez and Purtscher, Kraemer, Pick, and Hanke in Germany and in Austria, by Giessing in Norway, by Blegvad and Roenne in Denmark, by Traquair in Scotland, and by Cossu in Italy.

More frequent occurrence of the toxic amblyopia was observed again during World

War II. For example, in Rome (Focosi and Marisi) the figure rose from 0.29 percent in the prewar period to 1.08 percent in 1942; in Berlin (Lippold) the increase was from 0.76 percent in 1942 to 6.2 precent in 1946.

Similar observations come from Belgium (Weekers and Joiris; Schepens) and other parts of Germany (Bücklers). In Brussels Schepens found the number of cases of toxic amblyopia increased almost 50 times in 1942, compared to prewar figures. The reason for this increase is not clear. The poorer quality of tobacco is blamed, or the shortage of fats, or the lack of vitamins B_1 and B_2. The use of the vitamins, however, has not modified the course of the affection in Schepens' experience, and he is inclined to give weight to liver disturbances and to psychic factors.

Optic neuropathy due to bad nutritional conditions in Japanese internment camps was largely reported by British, Dutch, and American ophthalmologists. It was seen in some British camps in India, in Egypt (Borsello, Salvi, Bietti, Friemann and Magun) and in Europe (Fanta).

This kind of optic neuropathy was also observed in noninterned civilians during the Spanish civil war of 1936-39 (Soriano and Puiggari, Garcia) and especially in the Philippines during the Japanese occupation when there was severe food shortage (de Ocampo and associates).

This subject is too well known to merit further discussion by me; a review of the problem can be found in Leigh (*Ophthalmic Literature*, 1948, v. 2, p. 53). I wish only to point out that the amblyopia was occasionally accompanied by other manifestations—corneal lesions and neuropathies. It was also seen in that form of nutritional amblyopia often described as retrobulbar neuritis with central scotoma which is sometimes accompanied by restriction of the peripheral limits of the visual field.

In these cases the etiologic problem is not altogether solved. There is no doubt, however, that the ill-balanced diet, with faulty proportions of the dietary components, must have considerable importance. The fundamental cause is probably a deficiency of factors of the vitamin-B group, although lack of protein and toxic factors may facilitate the onset of the disease and worsen its course. In spite of the unquestioned influence of protein deficiency, it is to be noted that optic neuropathy was not usually found in German concentration camps although in these, as in the Japanese, there was a marked lack of proteins. Cases of acute hemorrhagic anterior polioencephalitis, with ophthalmoplegia, nystagmus, and general symptoms were, moreover, observed in prisoners of the Japanese by de Wardener and Lennox.

In this war also there have appeared hunger edemas, especially in German concentration camps and among the Greek civilian population. The scarcity of ocular manifestations has been confirmed, although we have information (R. Weekers, Höttinger, Balcet, Tranou-Sfalangaglou and Velissaropoulos, Schmidt, Winkler, Gasteiger) of pupillary disturbances, impairment of the light sense, increase in myopia, subconjunctival and fundus hemorrhages, neuroretinal edema, optic atrophy, macular degenerativelike changes, and principally lesions in the cornea. These corneal lesions, of a trophic-degenerative type with ulcerations, have been described by Djacos and his colleagues in Greece; they have been given the name of "superficial polymorphic keratopathy" and do not seem to be connected with vitamin deficiency.

Another ocular trouble which, as during and after the first World War (Netherlands, Rochat; in Germany, Gutzeit and Kassner; in Austria, Redding, Urbanek and Roschkott, Fronimopoulos; in Finland, Werner), has become more common during and after the last war is phlyctenular keratoconjunctivitis. The increased occurrence of this disease was reported by van der Hoeve in Holland, in 1942; by Marchesani, Gasteiger and others in Germany, in 1945-47; by Bellecci in Italy, in 1942-46; and by me at Pavia and Sassari, in 1942-48.

Balcet found it very frequently indeed (40 percent) among 2,000 tuberculosis-affected Italians interned in Germany during the period of malnutrition. The keratoconjunctivitis was promptly cured by an abundant diet after the liberation. The increase in the number of these cases must therefore be connected not only with the greater spread of tuberculosis, but also with a dietary deficiency; this probably consists in a lack of calories and proteins rather than of vitamins.

Chalazia and styes, according to an investigation I made at Rome, about tripled during the war. Certainly in these affections also, unsuitable food was the cause, although it is not easy to see whether the harm was done by toxic substances or was due to some protein deficiency—(Cockrun and associates). It would seem that vitamin-A deficiency was not concerned (Bolettieri).

In Greece, World War II was accompanied by a high incidence of pellagra cases with ocular complications, among them cataract (Djacos).

Food restrictions may have had a favorable effect on some eye disorders. Cavara and Bietti saw a reduction in the number of cases of diabetic retinopathy and hypertensive retinopathy in Rome (over 50 percent). I also noted that the dry eczema of the palpebral border (squamous blepharitis) completely disappeared in individuals deprived of a normal supply of fats because of internment; the trouble reappeared with the return to a normal diet after liberation.

According to Gros, limitations of the use of coffee in France led to a reduction in the number of cases of acute glaucoma in 1939-40. A lowering of the pressure in normal and glaucomatous eyes in patients on war diets was observed by Lucena.

2. Eye manifestations of toxic conditions

Among the toxic conditions caused by the consumption of unsuitable substitutes, I may mention the subconjunctival and retinal hemorrhages with retinal hypertension found among smokers of dried potato leaves in France (Sédan) and of the so-called home fermented "green tobacco" in Pavia and in France (Bourdier). Bad tobacco also provoked retinal angiospasm and accommodative troubles. Most frequent in Germany (Gasteiger, Jendralski, Euler, Siegert, Geserick, and others) and in Italy (Barazzoni, di Duca, and others) were cases of optic neuropathy caused by methyl-alcohol poisoning.

Among the Italian civilian population during the passage of the belligerent troops, there were various cases of botulism with ocular palsies. This fact (already observed during World War I by Bartels) was due to the consumption of tainted canned food abandoned by the military (Focosi).

3. Infectious diseases

As far as infectious diseases are concerned, this war, like World War I, has shown how difficult it is for soldiers to contract trachoma from civilians, even when stationed in regions where it is widespread. Cases were very rare indeed among the armies which fought in North Africa, Southern Italy (Gundersen), Poland, and Russia. On the other hand there were small epidemics of the Koch-Weeks' conjunctivitis.

The war, and to a greater degree the period following it, has, however, brought an increase in purulent conjunctivitis in newborns (Seefelder, 1919; Gasteiger, 1944-46), and of ocular tubercular manifestations (Thiel et al.). In certain regions, for example in Sardinia, the lack of quinine and the encampment of troops in open country without adequate shelter have caused the number of cases of herpetic keratitis to increase fivefold, paralleling, as we have seen, the increase in malaria. The fight against Anopheles with D.D.T. has now brought the frequency of herpetic forms below the prewar level (Focosi). An increased frequency of herpetic keratitis was also observed by de Grósz in 1945 in Hungary.

Wartime conditions also seemed to foster

the spread of epidemic keratoconjunctivitis in Italy. Its appearance was first verified after the arrival of the German troops who came from affected areas (Pasca). Reiter's disease was particularly observed among the military (Thygeson) during the two world wars.

4. Nervous conditions

As for ocular troubles connected with conditions of the nervous system, I wish to mention particularly acute glaucoma. An increase in its frequency was noted by Gros in France from 1940-41 on. At Naples, according to the figures of Bonavolontà, the number of cases of acute glaucoma jumped from about 1.40 percent in the prewar period to 3.50 percent during the war.

Similar observations were made by Gasteiger, Sédan, de Grósz, and were not unknown in the previous wars (de Wecker, 1870; de Lapersonne and Lagrange, 1914; Maiden, Pichler, A. Bietti, Seefelder, Szimanowsky, 1915-1918).

Psychic disturbances also have an influence, as I have been able to prove, on the frequency and intensity of concomitant squint. I will not dwell on the problem of psychogenic hemeralopia, for this has been sufficiently studied by British and American researchers. I will also pass over the ocular manifestations which are hysterical in origin, both in civilians and in military personnel, and which have shown an increase during the war years. There have also been more cases of "flicker scotoma." Psychic factors have also been advocated to explain the increased frequency of toxic amblyopia (Schepens, de Ocampo) and of phlyctenular keratoconjunctivitis (Wessely, Marchesani).

5. Climatic conditions

A further peculiarity of ocular pathology in wartime is the appearance of changes affecting the anterior segment of the eye (conjunctival hyperemia, tearing, vessel engorgement at the corneal limbus, blepharospasms, smarting of the eyes). There may also be a deficiency of the light sense, alterations in the visual field, and retinal asthenopia in individuals who fight in the desert or are obliged to work in the open under the sun (Livingston, Dumoulin, Dwyer, Ridley, Alajmo). To these troubles, which have been attributed to a lack of riboflavin, there is added the solar retinopathy of the macular region in airmen, gunners, sailors, and so on, who had to remain at posts with the sun in their eyes throughout an engagement. Tropical climate has also been held responsible for optic neuropathies and retinal changes in Japanese prison camps (Fischer and Moorrees).

Summary

This is only a summary of the most important observations made during and after World War II. The manifold factors which are able to act upon the eye may be enhanced or modified during war periods. Although the variety of these factors seems amazing, it is explained by the complex structure of the visual organ which is unrivalled by other organs or tissues of the body.

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SOLITARY TUBERCULOMA OF THE SCLERA*

In a patient with multiple advanced systemic lesions: treated with streptomycin

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The proliferative type of scleritis, caused by the tubercle bacillus and characterized by specific tubercle formation, is usually secondary and of hematogenous origin from a tuberculous focus.[1] The generally accepted opinion has been that such a focus is seldom, if ever, due to an active pulmonary lesion.

Alan Woods[2] states: "It is generally recognized that patients with pulmonary tuberculosis rarely show tuberculous ocular lesions. It is recognized that ocular tuberculosis is associated with such lesions as tuberculous adenitis, tracheobronchial tuberculosis, tuberculosis of the bone, etc."

Moore[3] concludes that "intra-ocular tuberculosis is always haematogenous in origin and is usually secondary to tracheobronchial infections, the pulmonary lesion usually being slight, quiescent, healed or calcified." Krückmann[4] states: "Tuberculosis of the eye is rarely associated with tuberculosis of the lung; but is frequently associated with tuberculosis of the thorax and abdomen."

However, there is an increasing number of articles, with case reports, which suggest that intraocular tuberculous lesions, including scleritis, occur more frequently in patients having active pulmonary infections than a review of the literature would seem to indicate.

Werdenberg[5] states that he "never has observed completely negative lungs in a patient with ocular tuberculosis." Kronenberg[6] reports a case of multiple tuberculous nodules of the episclera in a patient whose X-ray findings showed an active tuberculous lesion in the left upper lobe.

Chou[7] reported a case of tuberculosis of the sclera and cornea, with an excellent presentation of the microscopic findings in the enucleated eye, in which an active lesion in the left apex and along the left vertebral stem bronchus was suggestive by X ray.

Kronenberg[8] cites a case of Schulz that had multiple nodules of the conjunctiva and sclera, proven to be tuberculous by biopsy, in whom X-ray studies showed an active tuberculous lesion in the right chest.

Solitary tuberculoma of the sclera is a rare disease and very little concerning it is to be found in the American literature, foreign writers monopolizing this field. It is possible for such a lesion to be primary, due to trauma, but this would be extremely rare

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(Bell[8]). The lesion usually appears in the circumcorneal area and tends to involve the cornea and the underlying uveal tissue.

Verhoeff[9] considers a direct blood metastasis into the sclera to be improbable. He states: "It seems altogether improbable that scleritis is due to direct metastasis from the blood. Against this is the fact that blood metastasis to the sclera in cases of pyemia, malignant tumors, and miliary tuberculosis are practically unknown if not entirely so." His contention is that the infective organism gains entrance to the sclera through the aqueous or uveal tissue.

The prognosis, heretofore, has depended upon the virulence of the organisms, the degree and stage of the patient's general infection, and to the resistance of the patient. Where, as in most tuberculous ocular infections, the focus has been a healed or quiescent one, the prognosis has been fairly good in some cases, the process healing by cicatrix with more or less impairment of vision. In many cases, however, due to the extension into the cornea or uvea or both, there has been marked loss of vision and even the loss of the eye itself.

The literature does not contain any case report in which the lesion has occurred in a patient with advanced pulmonary or general tuberculosis. Given such a case, with the limited, recognized methods of treatment of the past at our disposal, one could logically expect disastrous results to the eye, provided the patient survived his systemic infection for a period long enough for this to occur.

The recognized treatment in the past has been confined to the treatment of the patient's general condition in conjunction with the thorough excision of the lesion followed with tuberculin therapy, when not contraindicated. X-ray therapy has been used with favorable results in some cases.

The case herein reported is one of a solitary tuberculoma of the sclera, in a white man, aged 49 years, a chronic alcoholic, who had an advanced bilateral miliary pulmonary tuberculosis, advanced laryngeal tuberculosis, advanced tuberculosis of the left kidney, fistula in ano, and an unusual type of a tuberculous lesion in the soft tissues of his back.

He was treated systemically with streptomycin only, and locally by atropine and the simple excision of the ocular lesion, with the ultimate arrest, to date, of all his lesions with the exception of his left kidney which was removed, and with corrected vision of 20/25 in his involved eye.

Case Report

History. L. G., a white man, aged 49 years, was first seen in the eye clinic March 26, 1947. He had been referred from the ear, nose, and throat department because of an inflamed left eyeball. The pertinent history and findings on his referring record included increasing hoarseness of five months' duration, associated with dysphagia for a month; loss of weight; and general weakness. His laryngeal examination showed a marked infiltration of his left larynx with advanced ulceration. His general appearance was that of an acutely ill patient.

Eye record. He first noticed a redness on the temporal aspect of his left eyeball three or four months previous to his examination; about two months prior to examination he had noticed what appeared to be a small growth starting in this reddened area. He denied having had any ocular pain or distress or any impairment of vision at any time.

Eye examination. The right eye was normal throughout.

Left eye: Lids, external muscles, and cornea were normal. The conjunctiva on the temporal aspect of the globe was intensely injected. There was a large, angry, indurated nodule extending from the upper portion of the temporal limbus back onto the sclera for a distance of one-plus centimeter, and occupying an area from about the 1- to 3-o'clock position (circumcorneal).

The apex of the nodule was elevated about 4.0 mm. above the surrounding cornea and sclera and showed evidence of necrosis with caseation. The conjunctiva was adherent over the surface of the nodule and the mass was firmly adherent to the sclera.

Several large, engorged, tortuous conjunctival vessels extended up and over the growth and a dense network of small vessels surrounded its base, extending up onto the nodule becoming much less evident near the apex.

The globe was not sensitive to palpation. The pupil was round and reacted, the iris appeared normal, the anterior chamber was normal and there was no involvement of the adjacent cornea.

Tension was 24 mm. Hg (McLean). Vision was: R.E., 20/20; L.E., 20/30. Under mydriasis, the

fundus was normal and there was no evidence of a mass opposite the external lesion.

Treatment. The patient entered the hospital and on March 31, 1947, the mass was removed flush with the sclera, using a sharp cataract knife. Upon removal it was found that the sclera beneath the lesion had been entirely destroyed, exposing the underlying dark uveal tissue in an oval-shaped area, slightly smaller than the base of the nodule itself.

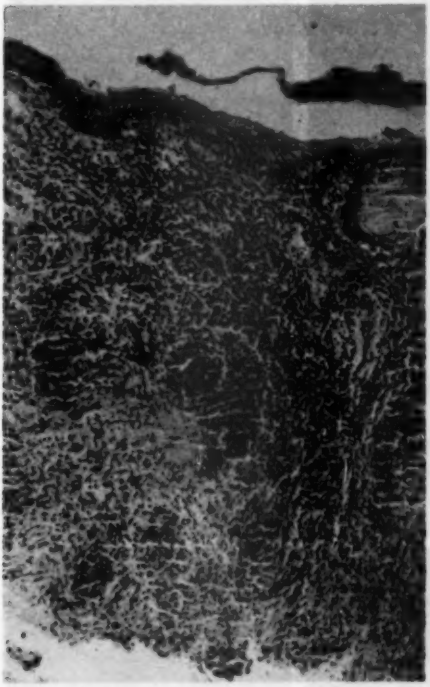

Fig. 1—a (Maiden). Granulomatous lesion showing central caseation necrosis (arrow).

There appeared to be a thin glistening membrane over the exposed uveal tissue and this area was freely indented by slight pressure. There was about one mm. of scleral tissue between the mesial margin of the wound and the cornea.

The biopsy showed the nodule to be a granuloma, tuberculous in nature (fig. 1—a and b). Unfortunately the specimen was not stained for bacilli. The sputum analysis and chest X-ray films were both positive for tuberculosis and he was transferred to the medical service.

Course. The patient was observed at frequent intervals during his streptomycin therapy, which was instituted on April 23rd, one gm., twice daily. There was very little change in the amount of reaction at the site of the lesion during the first six months; at times, there appeared to be a slight diminution and at other times a slight increase. In fact, the size of the lesion very slowly increased, associated with caseation on the scleral margins of the wound.

There gradually developed an ectasia that eventually protruded to the extent of 4 to 5 mm. above the surrounding sclera and cornea.

On May 8th, there was first noted some fine dustlike floaters in the vitreous. These never increased in size or amount. The pupil remained irregular in shape, becoming teardrop, with the point toward the 2-o'clock position, due to traction caused by the staphyloma.

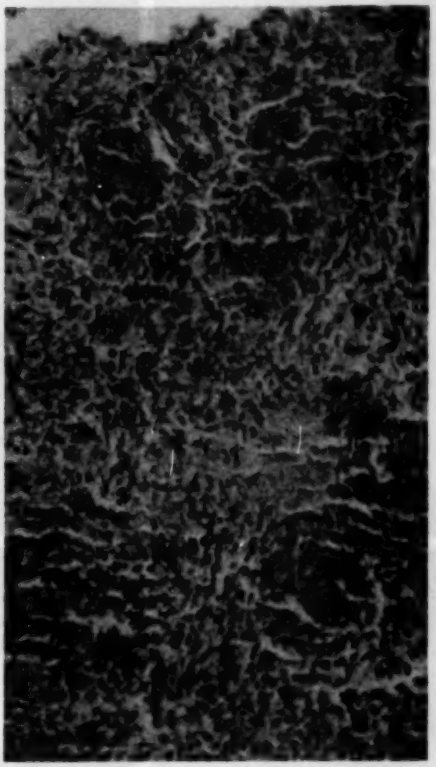

Fig. 1—b (Maiden). High-power view of same area.

By July 31st, his vision had decreased to 20/200 but was corrected to 20/25 with a −0.5D. sph. ⊂ +2.75D. cyl. ax. 180°. Tension was 19 mm. Hg (McLean). No evidence of any intraocular inflammation had been noted other than the dustlike floaters.

On September 15, 1947, the lesion still had an angry appearance, had increased in size, and the scleral portion of the margins was ringed with caseous necrosis. He complained of some distress in the eye and haziness of vision.

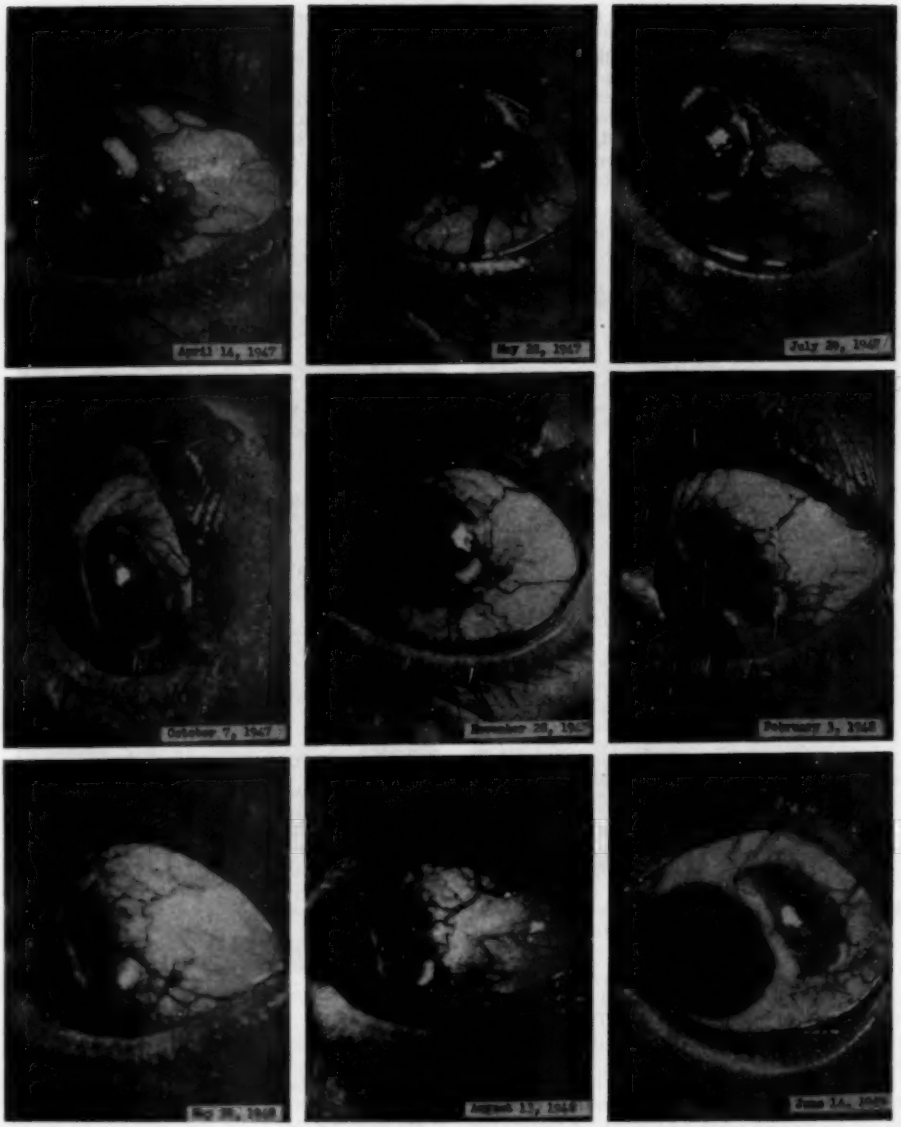

Fig. 2 (Maiden). Series of photographs taken during the period of treatment and convalescence. (Medical Illustration Laboratory, Kennedy Hospital.)

Slitlamp examination revealed several large keratic precipitates, mutton-fat in type, and some corneal haziness and edema, in the temporal portion adjacent to the lesion. There were no cells in the anterior chamber and the iris appeared normal, other than its shape. The fundus remained the same.

On September 23rd, the eye had been free of distress for three or four days.

Slitlamp examination showed edema of the corneal matrix in the temporal one third with marked wrinkling of Descemet's membrane near the temporal limbus and extending for some distance toward the center of the cornea. There were

a few cells in the anterior chamber and the iris appeared quite normal. There was no change in the fundus.

On October 29, 1947, the lesion showed its first definite signs of improvement, six months after the initial series of streptomycin was started.

The slitlamp examination showed no evidence of the recent reaction in the cornea; the keratic precipitates had absorbed and Descemet's membrane was free of wrinkles. The iris appeared normal and there was no change in the fundus. The vessels over and around the scleral lesion had decreased in number and size. The membranous covering of the staphyloma was more dense.

Due to the degree of the ectasia the anterior segment of the eye was distorted in shape causing a high degree of astigmatism. The patient's general condition showed signs of improvement and he was gaining weight.

From this time on, there was a slow but gradual improvement in the lesion, manifested by a decreasing amount of injection about the wound, a flattening of the scleral staphyloma, due to the increasing density of its covering membrane, and there was a progressive absorption of the caseous material about the scleral margins of the lesion. By December 15th, the patient had gained 26 pounds in weight and the lesion showed continuous resolution.

On March 9, 1948, there was noted considerable atrophy of the iris pigment in that portion adjacent to the wound; otherwise there were no changes in the intraocular structures. Vision was 20/100, corrected to 20/20—1 with a —2.5D. sph. ⊃ +5.0D. cyl. ax. 90°. There was progressive healing of the wound.

Further treatment. On August 8, 1948, due to the persistence of the infection in his left kidney, a second course of streptomycin was instituted. On October 22nd, the patient was examined after the termination of this second course of therapy. His left kidney had been removed 10 days previously.

There had been no exacerbation of his ocular symptoms. The lesion was more quiet, of a dark bluish-gray color with but a few large dilated vessels running over its surface and a lesser network of small vessels about its periphery. The lesion extended from about the 12:45- to 3:30-o'clock positions paralleling and adjacent to the limbus and was approximately one-plus centimeter in width. The staphyloma was much more flat and its membranous covering much thicker. Some caseous deposits were still present on the scleral margins.

There was an uninterrupted gradual improvement of all symptoms and on June 14, 1949, the pupil was slightly ovoid in shape but reacted normally. The atrophy of the iris, adjacent to the lesion, was present and the fine vitreous opacities remained.

Tension was 22/21 mm. Hg (Schiøtz). Vision was 20/70 corrected to 20/25 with a —1.75D. sph. ⊃ +4.0D. cyl. ax. 110°.

There were two small deposits of caseous material at the 3- to 5-o'clock position on the wound margins around which were numerous small vessels. The staphyloma was much less pronounced and it was covered with a dense membrane.

The patient's general condition was good, there having been an apparent cure or arrest in all of his tuberculous lesions. The internist anticipated discharging him from the hospital in the near future.

Discussion

This case is of interest for several reasons. This patient was one of the first with advanced general tuberculosis to be treated with streptomycin at Kennedy Hospital. His period of treatment antedated the recognition and use of synergistic drugs with streptomycin in the treatment of tuberculosis, and before it was known that good results were obtainable by the use of much smaller doses than those he received.

Starting on April 23, 1947, he received two gm. daily in divided doses for 120 days, or a total of 240 gm. He developed marked vertigo with spontaneous nystagmus after approximately two weeks of treatment which persisted until there was a total loss, bilaterally, of any vestibular response to stimulations.

His semicircular canals remained inert for about one year after the termination of the streptomycin therapy, when they began to show slight response to the caloric test—ice water. This response gradually increased until normal reactions were obtained bilaterally. There was no involvement of the cochleas except for marked tinnitus which disappeared after the treatment was discontinued.

Due to the persistence of the infection in his left kidney, a second course of streptomycin therapy was started in August, 1948. He received 0.25 gm., twice daily for 42 days, at which time the resistance of the organism to the drug was found to be 1,000 units per centimeter, at which point further benefit from the continuation of the therapy could not be expected, so the treatment was discontinued and his left kidney was removed.

This was the first case reported in any of the government hospitals (Veterans Administration, Army, Navy, Marine, or Public Health), with a tuberculous ocular lesion

proven by biopsy, to be treated with streptomycin.

It is the only case reported in the literature, of this date (December, 1949), in which there was a virulent tuberculous ocular lesion, in a patient with advanced multiple systemic tuberculous infections, where the eye had been saved with preservation of normal corrected vision.

Of interest to the oculist is the fact that the uveal tissue escaped being involved in the necrotic process, the reactions discernible being no more than those associated with contact. This can be attributed to the inhibiting action of streptomycin on the organisms which was enough to suppress local necrosis until such time that his general infection was sufficiently under control to permit local healing.

The patient was observed at frequent intervals over a period of 27 months. The notes recorded here together with the series of photographs depict quite accurately the clinical course of the ocular lesion (fig. 2). It will be noted that, although the necrosis was suppressed during the first six months of observation, there was a very slow increase in the size of the wound and no evidence of actual healing until there was manifest improvement in his systemic condition.

Further interest surrounds the fact that he survived an overwhelming systemic infection, which gave one the unusual opportunity to observe over a long period of time the slow resolution of his ocular lesion to ultimate healing. Past experience justifies the statement that had this patient not received streptomycin, our final observation would have been made from the findings at autopsy.

Summary

1. This case is one of solitary tuberculoma of the sclera which was present in a patient who was suffering from advanced miliary tuberculosis.

2. In all probability it was a secondary hematogenous infection.

3. The lesion was proved tuberculous by microscopic examination.

4. There was no involvement of the cornea or uveal tissue other than a moderate inflammatory reaction.

5. The ocular lesion healed with moderate deformity of the eyeball; corrected vision was 20/25.

6. No local treatment was given other than the initial excision of the mass and the use of atropine.

7. Patient was treated with streptomycin systemically, one gm. twice daily for 120 days, followed in one year with another course of 0.25 gm. twice daily for 42 days.

8. There has been an arrest, to date, of all his general infection except for that in the left kidney. Nephrectomy was necessary to eradicate the disease in that site.

Kennedy Hospital (15).

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OCULAR TUBERCULOSIS TREATED WITH STREPTOMYCIN*

A REPORT OF FOURTEEN CASES

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This report is based on case records of 14 patients with ocular tuberculosis submitted by 11 Veterans Administration hospitals in the United States. Seven of these are general hospitals and four tuberculosis hospitals. All cases were seen, diagnosed, and treated by the staff or consulting ophthalmologists.

INTRODUCTION

Tuberculosis of the eye is a difficult and controversial diagnosis. The only unquestionable diagnosis would involve demonstration of the organism in the affected part of the eye, positive culture, or a positive guinea-pig inoculation. These procedures are not possible except in those cases in which the adnexa and external eye are involved. It is, of course, not possible to take a biopsy of the internal eye although, under certain conditions, a biopsy of the iris is feasible.

Ocular tuberculosis is principally a clinical diagnosis. Certain lesions have been found to be pathologically demonstrable as tuberculosis. Other supporting criteria include: (1) Demonstration, directly or indirectly, of a reservoir of tuberculosis elsewhere in the body; (2) elimination of other etiologic agents, especially infectious granulomas; (3) chronicity and resistance to usual treatment.

All parts of the eye and its adnexa are susceptible to tuberculosis. The orbit and its contents, the lacrimal sac and gland, or the eyelid may be the site of tuberculosis.

The ocular diseases which most ophthalmologists would agree were probably of tuberculous origin are: (1) Ulcerative and hyperplastic forms of conjunctivitis, especially tuberculomas; (2) sclerokeratitis; (3) some ulcerative and deep keratitises; (4) tuberculoma of the sclera; (5) iritis with Koeppe nodules; (6) conglomerant tubercle of iris, ciliary body, or choroid; (7) chronic recurrent exudative iritis; (8) chronic recurrent exudative choroiditis; (9) miliary tubercles of choroid; (10) retinal periphlebitis with recurring vitreous hemorrhages (Eales's disease).

The usual source of the infection is endogenous from infected lymph glands and the spread is by the blood stream. Ocular tuberculosis is uncommon in patients with active and gross tuberculosis elsewhere in their bodies. This general rule, first stated by Axenfeld, has been verified by others.

Two types of ocular tuberculosis occur: (1) A proliferative manifestation in which tubercles form in the diseased part, and (2) an exudative allergic reaction. The latter is the more common.

The most important forms of tuberculous infection of the eye are those of the uveal tract. The types are diverse and may vary from the readily recognizable miliary tubercle to lesions showing nothing indicative of their pathologic process. The anterior and posterior uveitises may primarily, or as the result of complications, impair vision and destroy the eye.

REVIEW OF SPECIFIC THERAPY

The treatment of ocular tuberculosis is directed toward: (1) Improving resistance,

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general and local; (2) desensitization; (3) forestalling complications; (4) direct attack on the tubercle organism. In this paper we are concerned with the fourth mode of treatment.

Before 1940, no therapeutic agent had been found with any marked action against the tubercle bacillus. Then Feldman showed the effective action of certain sulfones in experimental tuberculosis in guinea pigs.[1] These were diasone, promin, and promizole. The first two drugs were too toxic, but promizole proved relatively nontoxic. In 1943, Waksman discovered streptomycin.[2] Shortly thereafter, its effectiveness in experimental tuberculosis was demonstrated.[3, 4] The use of these drugs in pulmonary tuberculosis was sufficiently successful to warrant their use in other types of tuberculosis including that of the eye.

Recent ophthalmic literature shows increasing use of streptomycin in ocular diseases from all causes.[5] However, there are but few reports of its effect on ocular tuberculosis in experimental animals or humans. Woods, working with rabbits, concluded that streptomycin has a "definite bacteriostatic and a partial bacteriocidal action against the tubercle bacillus in ocular tuberculosis."[6]

Other workers have shown that streptomycin penetrates the ocular tissues readily when given systemically (intramuscularly), or topically (iontophoresis).[7, 8] Penetration is poor in the presence of normal epithelium of the cornea.[9] Injured or inflamed cornea or the use of cocaine and benzalkonium chloride (zephiran) may permit greater penetration of streptomycin when used topically.

Flippin found that streptomycin, when given intramuscularly, produced a concentration in the intraocular fluids that approximated the concentration in the circulating blood.[10]

Streptomycin has been used intravitreally in doses up to 5,000 mg. in 0.1 cc. of normal salt solution.[7] Degenerative effects have been noted on the retina at this concentration.[11] Bellows found that 500 mg. did not produce retinal damage.[9]

Favorable clinical results in the treatment of ocular tuberculosis with intramuscular streptomycin have been reported by several authors.[5, 7, 12–13]

Case reports

We are reporting 14 cases. In eight of these, the iris and ciliary body were involved; in four, the choroid; one, the sclera; and one, the cornea. In 12 of these cases streptomycin was administered intramuscularly, one had topical applications of streptomycin ointment, and one was given dyhydrostreptomycin and paraminosalicylic acid.

Case 1

W. H. W., a white man, aged 62 years, had a history of tuberculosis dating back to 1918, when he was operated upon for tuberculous lymphadenitis. He was first admitted to a hospital in 1923 because of far-advanced pulmonary tuberculosis. Since then, he has been in Veterans Administration hospitals most of the time.

The first notation of any eye trouble was in 1926 when he was treated for congestion of both eyes. In the intervening years, he had attacks of episcleritis, iritis, and chorioretinitis of both eyes. The attacks became more severe, more difficult to control, and each time more permanent damage resulted. From 1926 to 1947 vision in the right eye diminished from 20/20 to 20/100, and in the left eye from 20/20 to 20/30.

In October, 1947, the left eye became red and inflamed, and a diagnosis of iridocyclitis was made. One-percent atropine eye drops and warm compresses failed to help. Vision at that time was 20/60.

On October 15th, intramuscular streptomycin was begun in one-gm., daily, doses. By November 3rd, the eye was less red. On November 20th, the photophobia and corneal infiltration had markedly diminished and the aqueous flare had disappeared. Vision improved to 20/30. By December 4th, the eye was almost white, and on December 17th, streptomycin was discontinued. The last examination, January 15, 1948, showed no recurrence of eye symptoms.

Case 2

R. A. H., a white man, aged 69 years, was admitted to the hospital May 22, 1947, with a diagnosis of chronic pulmonary tuberculosis.

On July 7, 1947, he developed symptoms first thought to be due to conjunctivitis. But two days

later, a diagnosis of acute tuberculous iritis of the right eye was made. He was first treated by hot compresses and instillations of one-percent atropine and 10-percent neosynephrin solutions. This resulted in very little improvement.

On July 23rd, streptomycin was started, 0.5 gm. intramuscularly twice a day. Eye examination at that time showed severe conjunctival injection of the right eye with circumcorneal congestion. There was pain, photophobia, and lacrimation. The pupil was small and did not react to light.

On July 30th, there was very marked improvement, no pain, very little photophobia, and the plastic exudate in the anterior chamber had diminished. By August 11th, there was practically no congestion and the aqueous flare was gone.

On August 21st the eye appeared normal and was white. The iritis was considered cured as of this date. Streptomycin treatment was continued until September 23rd.

CASE 3

S. P., a 26-year-old Indian man, was admitted to the hospital March 13, 1946, because of pulmonary tuberculosis.

In September, 1947, he developed an acute fulminating iritis of the right eye. Treatment with hot compresses and one-percent atropine was unsuccessful. Then one gm. of streptomycin intramuscularly was used daily for one week. There was still no success. The amount of streptomycin was increased to two gm. daily, and there was an amazing reversal of the process and a gradual and complete resorption of all the inflammatory exudate within 14 days. The patient then developed a widespread urticaria with joint swellings and the streptomycin was discontinued.

Four months later, the left eye became involved in a severe iritis and again there was no response to one gm. of streptomycin daily for eight days. With increased dose to two gm. daily, there was prompt improvement within 24 hours. Two weeks later there was normal vision and complete subsidence of the iritis.

After six weeks, the streptomycin was discontinued and within 24 hours there was prompt recurrence of the iritis. Streptomycin in one-gm. dose was resumed. This time the iritis cleared promptly. Streptomycin was discontinued after an additional 17 days. At the time of discharge, June 1, 1948, there had been no recurrence.

CASE 4

F. J., a 26-year-old native of Guam, was first found to have pulmonary tuberculosis in October, 1945. His first iritis attack in February, 1946, was treated with one-percent atropine solution and warm compresses to his right eye. He had subsequent attacks with synechia formation.

He was admitted to the hospital on June 4, 1947, complaining of burning of the lids, spots before his eyes, and blurred vision, especially in the left eye.

The conjunctiva and sclera of both eyes was diffusely reddened, more so in the left eye, and the left pupil was irregular in shape. The right eye reacted slightly to light but the left pupil was fixed. The fundi were not well visualized. His eyes did not clear on atropine and warm compresses. Vision of the right eye was 20/25; left eye, 20/25.

Slitlamp examination of the right eye showed many mutton-fat keratic precipitates, slight flare, pupil sluggish to light, and many posterior synechias. The left eye had almost complete annular posterior synechias. There were no cells or flare. Multiple deposits of iris pigment were on the anterior lens surface, with thinning and atrophy of the iris. The pupil had no reaction to light. Fundi at this time were normal, the fields were full.

Diagnosis was chronic iritis, bilateral, tuberculous. The patient was started on streptomycin, one gm. daily, and this was continued from July 11, 1947, to September 9, 1947.

An eye consultation after the course of streptomycin therapy revealed that the patient felt that the vision and his eyes in general were the same as before therapy. Vision at this time was: R.E., 20/30—1; L.E., 20/30+2. Slitlamp study revealed essentially the same picture as noted on first visit. There were posterior synechias bilaterally; the right eye showed a plus-one flare with mutton-fat keratic precipitates; the left eye showed a questionable flare. There were no other changes.

CASE 5

J. C., a 33-year-old Negro, first had pain in his left eye in the summer of 1945. He was hospitalized for a short period and treated with atropine eye drops. At the time of his discharge from the Army in October, 1945, there was some visual impairment of the left eye.

In October, 1947, both eyes hurt and he was treated at an out-patient department, but by December, 1947, the vision in his left eye was almost completely gone and the right eye had also become impaired.

Finally, he was hospitalized from January 25, 1948, to April 16, 1948, with a diagnosis of iridocyclitis, bilateral, and glaucoma of the left eye. At that time there was no evidence of pulmonary or lymph-node tuberculosis. When he was discharged from the hospital, his vision was: R.E., 20/50; L.E., 10/200. However, the vision continued to diminish and by August 9, 1948, vision in the left eye was light perception only.

He was readmitted to the hospital on October 8, 1948, with generalized febrile symptoms and a productive cough. His condition was diagnosed chronic pulmonary tuberculosis, far advanced.

Vision was: R.E., 20/100; L.E., light perception only. Both anterior chambers were shallow and the pupils were irregular and fixed by synechias. Exudate was present in both pupillary spaces.

On funduscopic examination of the right eye, no details were discernible; in the left eye, there was

no fundus reflex. Mutton-fat keratic precipitates were present in both eyes, the right especially. An aqueous flare showed in both eyes. Tension was: R.E., 16.5 mm. Hg; L.E., 50 mm. Hg (Schiøtz).

The ocular diagnosis at this time was bilateral uveitis, probably tuberculous, and secondary glaucoma of the left eye. The eyes did not respond to atropine and heat.

On October 18, 1948, streptomycin therapy was started (0.5 gm. twice daily). This was continued for 93 days. The patient's ocular pain and inflammation diminished but vision remained unimproved. At consultation on April 12, 1949, the eyes showed no change. The tension in the left eye was 36 mm. Hg (Schiøtz).

CASE 6

J. C., 27-year-old, white man was transferred from a tuberculosis hospital to a general hospital on February 9, 1947, because of redness and pain of his right eye. He had far-advanced pulmonary tuberculosis. There was a history of iritis of the right eye with the first attack in September, 1946.

Eye examination on admission showed that the sclera and conjunctiva of the right eye were inflamed and the eye was tender. He was placed on warm compresses, boric irrigations, and one-percent atropine eye drops. The condition continued the same, and, on April 4th, was diagnosed as tuberculous iritis, nongranulomatous type. There were large keratic precipitates and posterior synechias at the 3-o'clock position.

Streptomycin therapy was instituted on April 22, 1947, and he received 1.6 gm. intramuscularly daily until August 20, 1947.

The eye slowly improved. On August 4th, a flare-up occurred with pain and lacrimation. By September, there was not much change and there were minimal iris adhesions. In general, the eye looked better following streptomycin therapy.

Vision on admission was 20/100 in th right eye, and when last seen October 15, 1948, the eye was quiet and vision was 20/60.

CASE 7

L. G., a 49-year-old white man, was first examined in the out-patient department January 21, 1947, because of a chronic laryngitis. About the same time the patient had noticed redness of the temporal side of his left eye and a small lump in this area. He was hospitalized in March, 1947, and, at this time, an ulcer was found beneath the right cord. His left eye became worse.

Examination at this time showed that the lids, external muscles, and cornea were normal. The conjunctiva on the temporal aspect of the globe was intensely injected.

There was a large nodule extending from the limbus back on to the sclera for about one cm. and occupying an area from the 1- to 3:30-o'clock position. The nodule measured 3 to 4 mm. thick at its greatest elevation. The conjunctiva was adherent over the apex of the nodule and the mass was firmly adherent to the sclera. Engorged conjunctival vessels extended into and over the growth. There was a small area on the apex that had a punched-out appearance and another small area adjacent that showed necrosis.

The globe was not sensitive to palpation, and the iris appeared normal. The pupils were round and reacted normally. There was no involvement of the adjacent cornea. Tension was normal. Vision was: R.E., 20/20; L.E., 20/30. Funduscopy under mydriasis showed no pathologic condition and no evidence of any mass opposite the external lesion.

On March 31st, the nodule was excised flush with the sclera and the conjunctiva was sutured over the area. When the mass was removed, it was found that the sclera beneath the lesion had been entirely destroyed exposing the dark ciliary body and, that the choroid was covered with only a thin membrane. The laboratory reported a granuloma, tuberculous in nature.

There was but slight, immediate postoperative reaction. Because of a slight ovoid shape of the pupil, continued local reaction over the side of the granuloma, and dustlike floaters in the vitreous with a change in vision to 20/50, the patient was started on streptomycin intramuscularly, two gm. daily, on April 23, 1947. The reaction at the site of the nodule became greater, with swelling at both the upper and lower margins of the sclera.

By July 5, 1947, the area was not so angry in appearance. The vision was correctible to 20/25—2, and tension was normal. Streptomycin was discontinued July 21, 1947.

By July 31st, the inflamed area was smaller but there was a grayish-blue area in the center which seemed to be a bulging of the choroidal coat into the scleral wound. By September 10th the ectasia of the sclera was larger and there was marked injection with dilated vessels about the base of the area extending up on to it. The remaining portion of the lesion was dark blue in color and indented very easily by pressure with a cotton applicator.

By October 29th, the lesion showed the most encouraging signs of subsidence, The vessels were fewer and smaller in size. The membranous covering over the dehiscence was more dense but, due to the size of the scleral staphyloma, the anterior segment of the eye was disorted in shape causing a high degree of astigmatic error. On November 14th the staphyloma was not so pronounced and the covering membrane was thicker and more flat.

Funduscopic examination showed some fine vitreous opacities but otherwise the findings were normal. By December 1, 1947, the improvement was greater and the fundus was clear. In the following months the inflammatory reaction gradually subsided and the ectasia of the sclera flattened.

In April, 1949, the vision in the right eye was 20/20, and in the left eye, 20/70, correctible to 20/25+ with a −1.75D. sph. ⊃ +4.0D. cyl. ax. 110°. At this time the eye was quiet.

CASE 8

C. M., a 47-year-old white man, was first admitted to the hospital December 14, 1948, because of sudden blurring of vision and distortion of images in the left eye developing four weeks before admission.

He had had similar trouble with his right eye in September, 1945. The patient's chest X-ray films showed changes in and about the hilum believed to be a residual from a tuberculous infection, excessive in extent.

Vision on admission, was: R.E., no central vision; L.E., 6/15. Objects appeared distorted in such a way that the lines looked as though they were curved at the central section. A square or rectangular object had the appearance of being made up of four connected arcs of circles.

Ophthalmoscopically, the right fundus disclosed a large, white, degenerated patch in the temporal region involving the entire macula. Upward and temporalward to this area was another spherical pigmented area smaller than the disc. The fundus as a whole appeared somewhat cloudy. The fundus of the left eye showed a small spherical well-defined exudate in the macular region, 15 to 20 degrees from the optic disc in the 35th meridian, with several small hemorrhages adjacent to the disc.

The patient was given streptomycin intramuscularly, 0.5 gm. twice a day, for 20 days. Response was very favorable as manifested by vision increasing from 6/15 to 6/9, and the distorted appearance of objects being considerably diminished. During the streptomycin therapy, the patient had slight dizziness, thought to be due to the drug and it was stopped.

Another course of streptomycin was started on January 13, 1949, and continued for 21 days.

Visual acuity continued to improve and images looked more normal. Examination of the fundus at this time disclosed complete absorption with a pigmented spot in the left fundus leaving a scar where the inflammatory reaction had been. Blood vessels seemed normal. Corrected vision of the right eye at that time was still limited to light perception; that of the left eye improved to 6/9.

Diagnosis was: Right eye, old chorioretinitis; left eye, acute tuberculous chorioretinitis.

CASE 9

D. G. K., a 64-year old white man, was admitted to the hospital in May, 1947, with the complaint of loss of vision in both eyes of four years' duration. Both eyes had had previous attacks of blurring of vision. Each attack further diminished his sight. He retained some vision in the right eye until early in April when vision became limited to good light projection.

The left eye had light perception but faulty projection. The ocular tension in the right eye was 35 mm. Hg (Schiøtz); in the left eye, 20 mm. Hg. There was bilateral opacification of the cornea and bilateral cataracts. Mutton-fat keratic precipitates were present on the posterior corneas of both eyes. Both pupils were bound down on the anterior lens capsule with extensive posterior synechias. There was minimal bulbar injection in both eyes. It was impossible to see the fundi.

There was no evidence of systemic tuberculosis. Admission diagnosis was bilateral chronic iridocyclitis, with complicated cataracts and secondary glaucoma of the right eye.

He received two-percent homatropine solution and warm compresses. Under this regime, an allergy developed and the homatropine was discontinued. By July 11th there was no change in his condition. The low-grade inflammatory reaction continued.

Streptomycin was considered but the medical department felt that streptomycin should not be given because any destruction of the labyrinthine function would further incapacitate a virtually blind patient.

Finally, on October 20, 1947, it was decided to remove the cataract of his right eye. This was done and an iridectomy was performed at the same time. The pathologic report was chronic iritis. The patient had a postoperative small hemorrhage which absorbed by November 7th and he was able to count fingers with the right eye.

One week later the eye became inflamed and there was a flare-up of the iridocyclitis. Treatment with hot compersses and local sulfathiazole did not improve the condition. Finally, streptomycin intramuscularly was begun, 0.5 gm. twice a day, beginning on January 23, 1948, and continued until March 22, 1948.

Examination on February 20th showed that the eye had become quite white, tension was normal, and there was less flare in the anterior chamber. At the last examination on May 27, 1949, the patient appeared to be holding his own very nicely. Vision in the right eye was reduced to counting fingers. The tension was normal. There was no definite evidence of activity of the iridocyclitis in either eye at this time.

CASE 10

G. W. H., a 30-year-old white man, was admitted to the hospital October 25, 1948, complaining of poor vision in the right eye. The onset had occurred about September 7th with blurring of vision. This was followed by redness, pain, lacrimation, and photophobia of the right eye. The condition was diagnosed as iritis and treated by his private doctor with atropine, hot compresses, and foreign protein. The vision remained poor, however, and he was admitted for further examination and treatment.

Examination on admission showed moderate edema and redness of the right upper lid. There was ciliary congestion and keratic precipitates were grossly visible. The anterior chamber appeared hazy with a strong aqueous flare. The left eye was completely normal.

Because of an atropine sensitivity, 0.25-percent hyoscine solution was used as a mydriatic. In addition, he was given three intravenous injections

of typhoid. Vision in the right eye was limited to good light projection; the left eye, 20/15.

By November 9, 1948, there had been no change in his eye condition. Intramuscular streptomycin was begun November 17, 1948, 0.5 gm. twice daily, and stopped on January 2, 1949.

By December 14, 1948, the right eye was slightly less red. By January 6, 1949, the right eye was clearer but there was still a strong aqueous flare. At this time an anterior cataract became visible and fundus details could not be seen.

On February 8, 1949, there were fewer keratic precipitates and the anterior chamber was more clear with only a faint aqueous flare. The pupil dilated well but there were a few small posterior synechias.

This patient had a strongly positive tuberculin patch-test but no clinical tuberculosis. When last seen May 3, 1949, the anterior chamber of the right eye was clear but there was no improvement in the visual acuity. Fundus details were still not visible because of the cataract which had become more dense.

CASE 11

J. C., a 22-year-old Negro, had been treated at another hospital for tuberculous cervical lymphadenitis, tuberculous peritonitis, and pulmonary tuberculosis.

While home on trial leave, he developed a marginal keratitis in the right eye which subsided fairly well with the use of hot compresses and atropine. Shortly afterward, the eye became redder and more painful and he developed an area of heaped-up conjunctiva at the limbus inferiorly. The cornea at this site became infiltrated and opaque.

He was admitted to the hospital in January, 1949. On examination at this time, vision in the right eye was 20/70; left eye, 20/50—2. There was ciliary congestion with injection of the bulbar conjunctiva and nodule formation nasally in the right eye.

The cornea was slightly steamy with areas of keratitis nasally. The pupils reacted satisfactorily. Tactile tension was normal. Fundi were normal. The slitlamp showed no cells or flare. The impression was marginal keratitis, right eye, of tuberculous origin.

He was treated with one-percent atropine ointment and warm compresses. Four days later the eye was much worse with marked injection at the limbus extending from the 3- to 6-o'clock position, where congestion had caused an elevated appearance.

A course of streptomycin ointment, five times a day, to the right eye was begun January 25, 1949. A few days later, the patient developed definite iritis in the right eye but the medication was continued. Medication was continued 44 days. The The iritis subsided, the keratitis became less prominent, and the eye whitened gradually.

CASE 12

W. F. D., a 22-year-old white man, was admitted to the hospital April 17, 1947, because of pain and loss of function in the left hip. Studies revealed tuberculosis of the left hip.

On May 14, 1947, he complained of blurring in the right half of the visual field of his left eye. Examination at that time showed the vision to be: R.E., 20/20; L.E., 20/200. There were no external findings.

Funduscopy of the right eye revealed several small circumscribed areas of recent chorioretinitis near the temporal disc. In the left eye there was a fresh, almost disc-sized area of exudate, dark in the center and surrounded by a pale region. There were several small capillaries leading to this exudate. Elsewhere in the retinas small regions of whitish, slightly pigmented residue were seen.

Diagnosis at that time was probable miliary tubercles of the choroid, both eyes, in various stages of development and regression.

Streptomycin intramuscularly was begun May 4th. He received 2.1 gm. a day in seven divided doses. The course was continued for 90 days.

On examination August 7, 1947, the circumscribed area of chorioretinitis of the left eye was regressing as evidenced by an atrophic area of pigmentation and diminished vitreous cloudiness. However, there was a new small patch of exudate adjacent to the inferior disc that appeared active. The vision in the left eye was less blurred. The right eye was quiescent with old, small patches of chorioretinitis.

About August 15, 1947, the patient complained of headaches, photophobia, and vomiting. A lumbar puncture at this time revealed a tuberculous meningitis. Streptomycin was begun again.

Eye examination on September 5, 1947, showed bilateral papilledema, mild. By September 26, 1947, the discs were less edematous but a mild diplopia had developed. He complained of micropsia and metamorphopsia of the left eye, these conditions being compatible with the retinal destruction and changes of the left macula. No active chorioretinitis, that is, any choroidal tubercles, were seen at this time.

The patient's general condition became worse and he died on December 10, 1947.

CASE 13

G. A., a 24-year-old white man, was admitted to the hospital on July 26, 1946, because of impaired vision in both eyes. The first examination on April 12, 1946, showed the right eye to be normal, and the left eye had retinal edema with hemorrhages at the disc and evidence of retinal phlebitis.

By July, the patient had retinal hemorrhages of both eyes with an extension into the vitreous. The amount of retinal hemorrhage varied and a diagnosis of Eales's disease was made. This condition consisted of repeated retinal hemorrhages with periphlebitis and subsequent organization and retinitis proliferans.

His vision by August 9, 1946, was 20/20 in the right eye; in the left eye, light projection. Al-

though he was in the hospital until May 2, 1947, a complete work-up failed to demonstrate any systemic tuberculosis, although the tuberculin test was positive. While in the hospital he had repeated retinal hemorrhages into the vitreous of both eyes.

On March 1, 1947, the condition had not subsided so streptomycin intramuscularly was begun, two gm. a day. This was continued for 45 days. In the interim the patient had fresh hemorrhages in both eyes, and there was no noticeable change in eye condition.

He received rutin therapy because of an increased petechial index. His original petechial index was 19 on December 12, 1947, and by October 9, 1948, it was down to 5. All this time he had been on rutin therapy.

On discharge from the hospital, May 2, 1947, vision was: R.E., 20/70; L.E., 20/100. Since that time he has been under observation at intervals and fresh hemorrhages have occurred in each eye. At the present time the vision in his right eye is limited to light perception, left eye, 20/70.

Case 14

R. K. H., a 22-year-old white man, was exposed to tuberculous patients while in the Navy, where he served as a hospital corpsman. He was admitted to the hospital in April, 1947, with pleural effusion. Diagnosis was pulmonary tuberculosis with pleural effusion. He was discharged as an arrested case of tuberculosis with a left fibrothorax.

In March, 1948, he developed a productive cough and bronchitis, and a diagnosis of miliary tuberculosis was made at this time. He was placed on one gm. of dyhydrostreptomycin intramuscularly beginning March 11th.

Ocular examination on admission showed three lesions superior to the disc of the right eye and white exudates with blurred margins. Impression at this time was miliary tubercles of the choroid. At reëxamination on April 25th, several of the lesions appeared to be better demarcated and in the process of pigment migration.

At the final ocular examination on August 30, 1948, the lesions of the retina had become progressively smaller and were stationary. This patient also received paraminosalicylic acid.

On examination March 21, 1949, the media were clear, the discs of normal color, there was no blurring of the disc margins, and the vessels were normal. There were three discrete lesions superior to the disc of the right eye. These were white and slightly elevated with blurred margins and located in the choroid. Not much other reaction was seen. On April 25, 1949, the lesions seemed to be healing and the examiner felt that there were more lesions in the right eye than when seen initially.

By August 30, 1949, the lesions of the retina had become smaller. The left eye demonstrated one whitish-yellow lesion at the 9-o'clock position and one at the 3-o'clock position. No vitreous activity was present.

Discussion

These patients received from 41 to 385 gm. of streptomycin intramuscularly over periods of from 39 to 187 days. The daily dosage varied from 1 to 2 gm. Most of them received approximately 60 gm. over about 60 days. It is interesting to note that 10 patients out of the 14 had active tuberculosis elsewhere in their bodies—eight of these pulmonary, one cervical adenitis, and one meningitis and hip.

Of the 14 cases treated, 10 showed improvement. In a critical breakdown, 4 of the 14 cases could be certainly stamped tuberculosis (Cases 7, 12, 13, and 14). Two of these, or 50 percent, showed improvement. In the probable diagnosis group, there are seven cases (Cases 1 to 6 inclusive, and Case 11). Five of these, or 71 percent, showed improvement. In the remainder of the cases, the diagnosis might be called presumptive (Cases 8, 9, and 10). All were benefited by treatment. Case 3 did not respond to one gm. of streptomycin daily, but when changed to two gm., there was immediate improvement. This type of response was obtained twice on the same patient.

It was noted that four cases showed improvement (Cases 2, 3, 5, and 6). Toxic reactions occurred in Cases 1, 3, 8, and 12. Blood streptomycin levels were done on two cases, Case 2 where it reached a level of six μg. per cc., and Case 4 with a level of 5 to 10 μg.

Factors to be considered before conclusions are drawn include the effects of therapy other than streptomycin, surgical interference, the time interval before improvement occurred, and, lastly, the duration of the improvement. In addition to streptomycin these patients received mydriatics and warm compresses.

Case 10 was the only patient to receive foreign-protein therapy. Active tuberculosis, especially pulmonary, is a contraindication to the use of foreign protein.

Two patients had surgery. In Case 7, there

TABLE 1

OCULAR TUBERCULOSIS TREATED WITH STREPTOMYCIN

Case	Ocular Diagnoses	Other T.B.	Dose (gm.)	Days Continued	Total Dose (gm.)	Result
1	Iridocyclitis, O.S.	Pulmonary	0.5 b.i.d.	63	63	Marked improve.
2	Iritis, O.D.	Pulmonary	0.5 b.i.d.	62	62	Cured
3	Iritis, O.D.	Pulmonary	0.5 b.i.d. to q.i.d.	39	57	Completely subsided
4	Iritis chronic, O.U.	Pulmonary	0.5 b.i.d.	60	60	Unchanged
5	Iridocyclitis, O.U. Secondary glaucoma, O.S.	Pulmonary	0.5 b.i.d.	93	93	Worse
6	Iritis, O.D.	Pulmonary	0.4 q.i.d.	120	192	Improved
7	Scleral tuberculoma, O.S.	Pulmonary	2.0 daily	90	180	Unchanged
8	Chorioreinitis, O.S.	None	0.5 b.i.d.	41	41	Response very favorable
9	Iridocyclitis, chronic, O.U.	None	0.5 b.i.d.	59	59	General improvement
10	Iridocyclitis, O.D.	None	0.5 b.i.d.	45	45	Very definite benefits
11	Keratitis, O.D.	Cervical gland Peritonitis	Oint. 5,000 μg./gm. (5×)	44	—	Subsided
12	Tubercles of choroid, O.U.	Meningitis and hip	2.1 daily	187	385	Lesions regressed, patient died
13	Eales's disease, O.U.	None	2.0 daily	45	90	Unchanged
14	Tubercles of Choroid, O.D.	Miliary	Dyhydro. 0.33 t.i.d.	126	126	Improved

was surgical excision of the tuberculous lesion and the persistent reaction was controlled by streptomycin. In Case 9, there was a cataract extraction of the right eye but the iridocyclitis persisted. It subsided under streptomycin therapy.

Over a sufficiently long period some cases might have spontaneously subsided. It is difficult to set any time length during which improvement could be attributed to therapy rather than spontaneous resolution. Reasonably, improvement should occur within 30 days. In our cases the shortest period in which improvement was noted was eight days and the longest 119 days. Most improved in 3 to 4 weeks. In the group of certain and probable diagnosis of ocular tuberculosis, seven cases improved but only four within 30 days. The acute cases responded more quickly than the chronic. This correlates with the experimental work of Woods who demonstrated that early treatment was more effective than late treatment.

It may be concluded that streptomycin is of value in the treatment of ocular tuberculosis. It is of special value in those patients for whom foreign-protein therapy is contraindicated.

In view of the success reported recently, obtained by using streptomycin in combination with promizole[13] and because of the experience of the Veterans Administration hospitals,[14] it is probable that, in the future, combinations will be more generally used.

The Veterans Administration has already outlined two routines for the treatment of ocular tuberculosis. The first consists of streptomycin, one gm. in a single daily dose intramuscularly for 120 days, and 12 gm. of paraminosalicylic acid daily for a similar period. The second substitutes dyhydrostreptomycin for the streptomycin.

Crile Hospital (9).

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FURTHER STUDIES IN THE RELATIONSHIP BETWEEN HETEROPHORIA AND PRISM VERGENCE*

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In a previous paper[1] we reported the results of a study on the relationships between lateral heterophoria, prism vergence, and the near point of convergence. There is an idea that a significant relationship exists between prism vergence and heterophoria measurements at the same testing distance. Such a concept was exemplified by the regulations of the flying services of the Armed Forces during World War II.

For example, if a candidate for flying training had six prism diopters of esophoria at 20 feet, he was required to have at least six diopters of prism divergence at the same testing distance in order to be acceptable. No test of heterophoria or prism vergence was made at 13 inches.

Our previous study indicated that the correlation between lateral heterophoria at far and prism divergence at far was small

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although significant (−0.14 in males and −0.18 in females; to be judged significant with a five-percent chance of being in error, the product moment coefficients of correlation should exceed ±0.14, and with a one-percent chance, ±0.18).

From these figures, it appears that not a great deal of reliance can be placed upon the relationship of esophoria and prism divergence at 20 feet. The present work takes a correction factor into account and indicates that the conclusion just stated is probably incorrect. The correction factor is of interest.

Pascal[2] and others have stated that measurements of prism vergence should be divided into two categories: *true* prism vergence and *apparent* or manifest prism vergence. They have implied that there is a definite relationship between lateral heterophoria and prism vergence at testing distances of both 20 feet and 13 inches. Their reasoning is along the following lines:

Heterophoria is a deviation of the eyes which is prevented from occurring by the fusion mechanism. Tests for heterophoria produce varying degrees of dissociation of the two eyes and thus allow a latent deviation to become manifest and measurable. Tests of prism vergence, on the other hand, are tests of the power of the fusion mechanism. In tests of heterophoria, fusion is disrupted; in tests of prism vergence, an attempt is made to preserve fusion as long as possible.

If a person has exophoria, there is a tendency of the eyes to deviate outward but the deviation is kept latent by the fusion mechanism. Assume that such a person has five prism diopters of exophoria at 20 feet as determined by the Maddox-rod test, and that his prism convergence measured for the same testing distance is 20 prism diopters. The figure of 20 prism diopters is the *apparent* or manifest prism convergence at 20 feet.

However, it is assumed that actually the person requires an additional five prism diopters of convergence at 20 feet to combat or neutralize the five prism diopters of exophoria at the same distance. Thus, the *true* prism convergence should be considered as being 20 plus 5 or 25 diopters.

The same person is found to have eight diopters of prism divergence at 20 feet. It might be assumed that he gained the first five diopters of this divergence by merely "giving in" to his five prism diopters of exophoria and, when this had been done, he was then able to diverge only an additional three prism diopters. Thus his *apparent* or manifest prism divergence is eight diopters while the *true* divergence is only three diopters at the 20-foot testing distance.

The convergence-divergence ratio in this instance would be 20:8 or slightly more than 2:1 for the *apparent* or manifest vergence; the *true* vergence ratio would be 25:3 or slightly more than 8:1.

Similar examples may be cited for persons with esophoria instead of exophoria and the convergence-divergence ratio determined for distances of both 20 feet and 13 inches.

A study by Abraham[3] suggested a clinically significant relationship between prism divergence at 13 inches and heterophoria at the same testing distance. The existence of this clinical relationship was confirmed.[4] The clinical relationship was definite and we were therefore puzzled when our previous study[1] indicated such a weak statistical relationship between lateral heterophoria and prism divergence. If figures for *true* vergence instead of *apparent* or manifest vergence are utilized in studying such relationships, the results are different and assume definite statistical significance in keeping with the observed clinical significance.

Sample and Testing methods

Data were used from the previous study[1] and the apparent prism vergence measurements were converted to true vergence measurements by using the heterophoria readings at the same testing distances. Correlation coefficients were then determined

utilizing the figures for true vergence. All the details of testing are given in the previous report and will not be repeated here.

Results

The results are shown in Table 1. Inspection of the table will reveal that there is still no statistically significant relationship between age, spherical equivalent of the refractive error in the right and left eye considered separately, sex, and heterophoria. Neither is there any statistically significant relationship between *true* prism vergence and sex, age, or refractive error. There is, however, a significant relationship between true prism divergence and lateral heterophoria.

The correlation coefficients for the relationship between lateral heterophoria and apparent prism divergence at 20 feet are −0.14 for males and −0.18 for females. When true prism divergence is substituted for apparent prism divergence, the correlation coefficients are +0.50 for males and +0.65 for females. These coefficients had to be greater than ±0.18 to be judged significant with a one-percent chance of being in error. The difference between an r of 0.50

TABLE 1

RELATIONSHIPS BETWEEN AGE, REFRACTIVE ERROR, NEAR POINT OF CONVERGENCE, HETEROPHORIA AND PRISM VERGENCE

$N = 401$ 184 Males 217 Females	Sex	Correlation* with:									
		N.P.C.	Heterophoria at 20 Feet	Prism Convergence at 20 Feet	True Prism Convergence at 20 Feet	Prism Divergence at 20 Feet	True Prism Divergence at 20 Feet	Heterophoria at 13 Inches	True Prism Convergence at 13 Inches	Prism Divergence at 13 Inches	True Prism Divergence at 13 Inches
1. Age	M	0.13	0.17	−0.16	0.01	−0.06	−0.04	−0.12	0.43	0.14	0.00
	F	0.06	−0.20	−0.10	−0.03	0.08	−0.05	−0.19	0.14	0.13	−0.10
2. Refractive error† right eye	M	0.08	0.08	−0.15	−0.19	−0.01	0.06	0.00	0.03	−0.11	0.02
	F	0.01	−0.07	−0.11	−0.10	−0.01	−0.03	0.01	0.03	0.00	0.00
3. Refractive error† left eye	M	0.21	0.08	−0.20	−0.22	0.07	0.08	−0.01	0.01	−0.06	−0.09
	F	0.00	−0.06	−0.08	0.02	−0.02	−0.05	0.12	−0.12	−0.03	0.08
4. N.P.C.	M		0.00	−0.23		−0.03		−0.15		−0.02	
	F		−0.08	−0.22		0.08		−0.25		0.03	
5. Heterophoria at 20 feet	M			0.16	−0.11	−0.14	0.50			−0.20	0.33
	F			0.09	−0.10	−0.18	0.65			−0.32	0.33
6. Prism convergence at 20 feet	M					0.09	0.01				
	F					0.01	−0.31				
7. Prism divergence at 20 feet	M										
	F										
8. Prism divergence re-fuse at 20 feet	M					0.67					
	F					0.71					
9. Heterophoria at 13 inches	M									−0.19	0.42
	F									−0.32	0.74
10. Prism convergence at 13 inches	M										
	F										
11. Prism divergence at 13 inches	M								−0.31		
	F								−0.62		

* Product moment coefficients of correlation. To be judged significant with a 5% chance of being in error, it should exceed ±0.14; with a 1% chance, ±0.18.
† Spherical equivalent.

for males and 0.65 for females is not significant and could easily have arisen by chance.

The correlation coefficients for the relationship between lateral heterophoria and apparent prism divergence at 13 inches are −0.19 for males and −0.32 for females. When true prism divergence is substituted for apparent prism divergence, the correlation coefficients are +0.42 for males and +0.74 for females. The difference between an r of 0.42 for males and 0.74 for females is significant, being too large to have arisen by chance.

We are not prepared to offer any explanation for this difference between the sexes at this time. The previous study[1] did show that males show a slight but significant trend toward more esophoria as they get older; females, on the other hand, show a similar slight but significant trend toward less esophoria with increasing age.

Coefficients for the relationship between lateral heterophoria at 20 feet and either true or apparent prism divergence at 13 inches are about the same.

Coefficients for the relationship between true prism convergence and true prism divergence at 13 inches are −0.31 for males and −0.62 for females and are thus also statistically significant.

Discussion

The clinical application of the data from this study is of interest because it should be possible to evaluate lateral heterophoria properly from the standpoint of clinical significance by means of studies of true prism divergence.

If the clinician is consulted by two patients, both of whom have eight prism diopters of esophoria at 20 feet, six prism diopters of esophoria at 13 inches, and almost identical symptoms of asthenopia, it would be of value to know whether or not the esophoria is a likely cause of the associated symptoms in each case.

If the apparent prism divergence at 13 inches of the first patient is 12 or more, while that of the second is below 12, then (in all probability) the symptoms of the first will be relieved by glasses and are not due to the esophoria, while those of the second will persist in spite of glasses and are due to the esophoria.

In other words, the esophoria in the second patient is clinically significant while that in the first is not. The second patient will require more than glasses to be free from his symptoms and may, in fact, even require an operation before complete comfort may be attained for prolonged close work.

Our own previous studies and clinical experience have indicated that a person must have at least 12 diopters of apparent or manifest prism divergence at 13 inches if he is to work comfortably at that distance. The significant statistical correlation between prism divergence at near and heterophoria lends added support to a clinical observation that heretofore seemed based almost solely on empirical grounds.

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OCULAR MUCORMYCOSIS*

Report of a case

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The cases of mucormycosis of the central nervous system and ocular regions that have been reported in the recent literature have had a remarkably stereotyped history and clinical picture. The case of Paltauf[1] and three cases reported by Gregory, Golden, and Haymaker,[2] as well as the single case reported by Le Compte and Meissner,[3] all have a similar picture.

The typical story of these reported cases deals with a middle-aged patient who was seriously ill, usually in a semicomatose or mentally confused condition due to a diabetic coma or acidosis. Shortly after admission, evidence of infection of the central nervous system and orbital cellulitis manifested itself. Despite treatment for diabetes and chemotherapy the patients died.

Unfortunately, a fungus infection was not suspected in any of the cases. The diagnosis was made only after study of tissues obtained after death. It was then not possible to make cultures to identify the organism definitely.

The following case is presented because of its difference in history and general physical findings:

Report of a case

History. J. D., a 10-year-old boy, gave a history of having had poor vision in the right eye four years ago. There was no history of trauma, disease, or acute infection. One year ago examination of the right fundus showed a yellowish area near the macula and disc. The vitreous was filled with dustlike opacities and, among these opacities, were several rhomboid-shaped, highly refractile bodies. The retina inferiorly appeared to be detached but no hole could be seen. There was a pale, gray, pigmented, elevated area in the lower temporal region. A diagnosis was made of Coats's disease.

He was seen again six months later, at which time the entire posterior portion of the fundus appeared to be elevated and neither the disc nor the macula could be identified. The elevated portion showed many vessels with aneurysmal dilatations.

Two months later the right eye became red and painful and the tension was 56 mm. Hg (Schiøtz). The cornea was edematous. The anterior chamber contained no cells or flare. The iris was atrophic with an ectropion uvea. The vitreous was relatively clear but the mass in the posterior portion of the eye was considerably larger. The left eye was negative. The clinical diagnosis was acute secondary glaucoma due to (1) Coats's disease, (2) ? retinoblastoma. Because of the pain and possibility of retinoblastoma, the eye was removed.

Macroscopic

Upon sectioning the eye grossly, it was found that the retina was completely detached and there was a small area of calcium near the disc. The globe was somewhat smaller than normal and was flattened in the anterior-posterior dimension.

Microscopic

The retina is completely detached with two large cystlike structures at the posterior pole. The cornea appears normal throughout. The anterior chamber is filled with pink-staining material. The angle is completely occluded by a wide anterior synechia.

On the anterior surface of the iris there is a thick layer of fibrous tissue. The contracture of this tissue has caused an ectro-

* From the Institute of Ophthalmology of the Presbyterian Hospital. Presented before the New York Academy of Ophthalmology, January, 1951.

pion uvea. Schlemm's canal can be seen but, due to the wide anterior synechia, normal filtration could not take place.

The ciliary body is atrophic. In the region of the ora serrata there is a marked proliferation of the pigment epithelium and fibrous tissue to form a large ring of Schwiele.

The retina is markedly atrophic and the various layers can be identified only with great difficulty. The subretinal space is filled with a pink-staining homogeneous material and in this space there are large numbers of macrophages which contain pigment and some cellular debris.

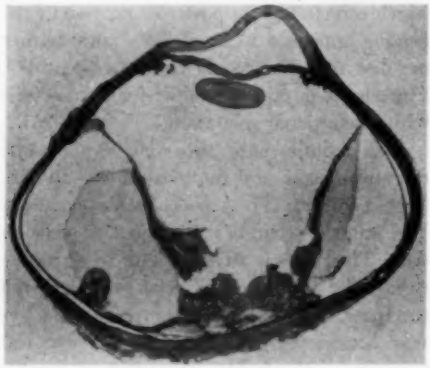

Fig. 1 (Wadsworth). There is a massive fibrosis of the retina in the posterior portion of the globe. The retina is completely detached. (Low-power view.)

In the region of the macula is a deposition of calcium with bone formation and some fibrous tissue in the choroid and subretinal space. At this point the retina is firmly adherent to the choroid and all of its elements are disorganized. There is considerable inflammatory reaction and some fibrous tissue scarring.

Extending from this area into the subretinal space is a tonguelike projection of fibrous tissue which shows various degrees of degeneration and contains numerous cholesterin crystals. Considerable cellular debris and a large number of pigment granules are present in the fibrous area.

Incorporated in the scar near the optic nerve are numerous structures which resemble a fungus. The structures are nonseptate and have numerous branches. The walls of the branching hyphae are sharply outlined. Very little inflammatory reaction is seen immediately surrounding these structures. Branching and lack of septa definitely places them in the group of phycomycetes, and their general appearance closely resembles Mucor.

The choroid shows some thickening of the lamina vitrea but otherwise it is not remarkable except in the immediate area of inflammation. The sclera is normal and the optic nerve is normal.

Sequence of events

A hemorrhage apparently occurred in the region of the macula due to some inflammatory process, with subsequent formation of fibrous tissue and calcification with bone formation. Contraction of the portion of the retina involved caused it to become detached. The inflammatory process apparently was of a low grade, not sufficiently severe to cause necrosis capable of causing the formation of fibrous tissue. It is difficult to determine the role of the fungus organisms that are found in this tissue since so little inflammatory reaction has taken place around them.

The following are the pathologic diagnoses: *Retina:* Detachment following chorioretinitis; massive retinitis (Coats's disease); disciform degeneration of macula; retinitis due to mucormycosis.

Sections of this case were studied by Dr. J. Gardner Hopkins, Columbia University, College of Physicians and Surgeons, Department of Dermatology, who reported as follows:

"Mrs. Schnall and I have studied the sections from this patient with great interest. I think there was no question that the filaments in the section are fungus and in these stains we could see no septa which would put it in the group of phycomycetes, but I do not think it possible to go further

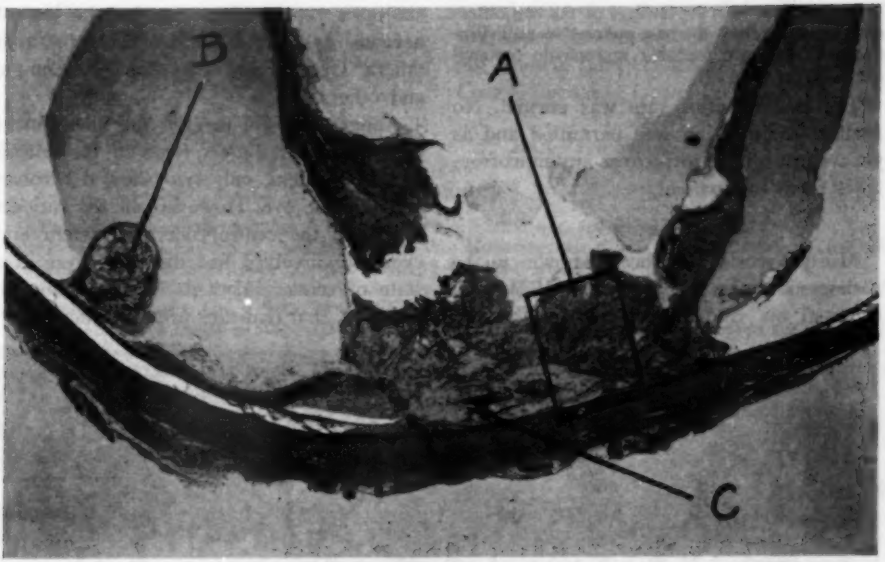

Fig. 2 (Wadsworth). A higher power view of the posterior segment of the globe. (B) Old hemorrhage with cholesterol crystals. (C) Bone formation in the region of fibrosis. (A) See Figure 3.

than this without a culture and we cannot even be sure of this in these stains.

"If you have remaining sections, a Gram stain and a Giemsa stain might show up the mycelium better. It is always baffling when fungi are found in a fixed specimen after all possibility of making cultures has passed.

"I cannot suggest much as to further investigation of the patient except that, from my recollection, most Mucor infections of the eye spread from infections of the nasal sinuses. It might be worthwhile to study his sinuses carefully and perhaps make cultures from as far up the nose as material can be obtained even if no lesion is found."

A section was also studied by Dr. Norman F. Conant,[8-a, b] Department of Bacteriology, Duke University, who reported the following:

"The wide non-septate hyphae seen in the section is what is usually referred to as Mucor. Although it is impossible to tell exactly what the fungus might be without cutures, many such reports have called this type of material a mucor and the disease mucormycosis. It is probably the only way such material can be handled."

The convalescence following the enucleation was entirely uneventful. The patient showed no evidence of any infection and the socket was clean at all times and healed promptly. After studying the sections of the globe the patient was reëxamined and the following laboratory procedures were carried out:

Complete blood count showed the white count to be 6,000; red count to be 4,800,000, with a hemoglobin of 14.8 gm. The differential was normal; urine examination showed a specific gravity of 1,022, albumin was negative, sugar was negative, and microscopic was negative. Blood sugar was 90; chest X-ray films were reported as being entirely negative; sinus X-ray studies showed no evidence of any infection. Special cultures of the nose, throat, and eye gave the following report: Eye swabs: four cultures were negative for fungi. Throat swabs: four cultures were negative for fungi. Nose swabs: four cultures—(1) culture was Penicillin SP; (2), Trichoderma SP; 3 and 4 were negative for fungi.

Mrs. Edith L. Schnall, assistant mycologist, College of Physicians and Surgeons, reports on the cultures as follows:

"I would consider the findings of the two different organisms from the nose cultures as an indication that they are probably saprophytic contaminants."

The sedimentation rate was normal. No further examination was permitted and as yet we are unable to recover any mucormycosis from this patient.

Discussion

Mucormycosis has been known to be pathogenic since Lichtheim,[4] in 1884, first reported his study and described the two then-known strains, Mucor corymbifer and Mucor rhizoporidormis.

Shortly after Lichtheim's work, Paltauf[1] reported a human infection that was generalized involving the lungs, brain, lymph node, intestines, and other organs. It was thought that the portal of entry in this case was the intestines.

There have been a number of cases reported involving various organs of the body but as brought out by Gregory, Golden, and Haymaker,[2] this infection usually involves a single organ or system and the most common organ is that of the lung and, next, the ears.

The least often affected is the central nervous system. In the literature there are six cases reported that involve the central nervous system: Paltauf,[1] Hafström and others,[5] Gregory and others,[2] and Le Compte and others.[3]

Apparently, still rarer is the involvement of the eye. Of the six cases of the central nervous system, only two showed involvement of the eye. However, all the patients in whom the central nervous system and eye were involved had diabetes, were in a state of coma, and died. It is well known, however, that diabetics are notoriously susceptible to most types of infection and fungus infection is particularly high.

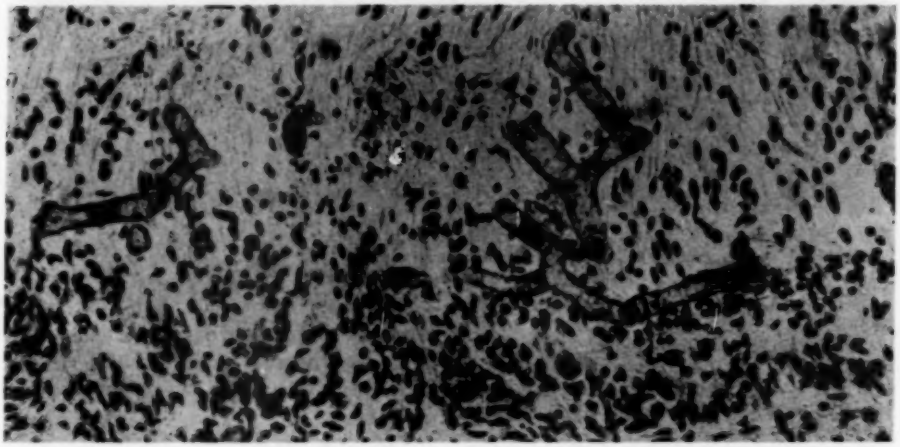

Fig. 3 (Wadsworth). High-power view of insert from Figure 2. Mucormycosis in the retina. There is no evidence of inflammation surrounding the organisms. (Magnification, ×200.)

Cogan,[6] in his very thorough article on endogenous intraocular fungus infections, considered mucormycosis for one patient he described but the organisms did not meet the criteria for this group and was classified as actinomycosis.

The clinical picture of my case was similar to that described by Coats[7] in 1908. The patient is a young male in good health without antecedent illness who had progressive loss of vision in one eye. There was a yellowish, raised area beneath the retina in the posterior portion of the eye. Cholesterol crystals and some pigmentary disturbance were pres-

ent. Many aneurysmal dilatations were seen in the vessels near the lesion.

Summary

The case reported is that of Mucor infection in the eye. This is the only known case that involves the eye alone. There is no associated diabetes and the portal of entry is not known. The clinical picture is that of Coats's disease.

73 East 71st Street (21).

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CLINICAL AND EXPERIMENTAL STUDIES WITH TISSUE SCRAPINGS IN EXTERNAL OCULAR DISEASES*

With additional reference to the use of antihistaminics in herpes-simplex infections

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The rapid advances in chemotherapy in the last decade or so have relegated diagnosis to a more or less unimportant and unglamorous supporting role. It certainly seems apparent that the amazingly wide spectrum of therapeutic benefit exhibited by each new drug individually tends to make exact diagnosis unnecessary. On the other hand, some entities and previously unrecognized conditions, or variations, have, by their resistance to modern therapy, become subjects for more intensive scrutiny and, in general, demand ever more careful differential diagnosis.

A means of differential diagnosis, namely, tissue scrapings, has been recently advocated in gynecology by Papanicolaou[1] and in ophthalmology by Thygeson.[2] The accessibility of lesions in the lids, conjunctiva, and superficial cornea makes it a relatively simple matter to scrape them lightly with a moderately sharp spatula or spud. The material so collected is spread on slides, fixed with heat, and then stained with Gram's and Wright's or Giemsa stains.

For best results the scrapings should be taken from areas of maximum clinical involvement, they should be shallow enough to stop just short of drawing blood, and they should be spread thin enough on the slides to permit observation of single layers of cells.

In the interpretation of the slides the following outline, modified from Thygeson,[2] lists the cytologic findings in the most common types of external ocular affections:

* Presented before the second annual Wills Hospital Conference, March 1950.

Outline of slide diagnosis

Polymorphonuclears occur in:

1. All bacterial infections of the conjunctiva, except N. catarrhalis and Diplobacillus (Morax-Axenfeld), which are characterized by fibrinous exudate.
2. Fungi—Streptothrix.
3. Certain atypical viruses—trachoma, inclusion conjunctivitis, and lymphogranuloma venereum.

Mononuclears (usually small lymphocytes) occur in:

1. Epidemic keratoconjunctivitis.
2. Acute follicular conjunctivitis of Béal.
3. Herpes simplex conjunctivitis.
4. Molluscum contagiosum conjunctivitis.
5. Verruca vulgaris conjunctivitis.

Eosinophils and Basophils occur in allergies:

1. Vernal catarrh.
2. Hay-fever conjunctivitis.
3. Various drug and cosmetic allergies except eserine and pilocarpine sensitivity and bacterial allergies (phlyctenular conjunctivitis).

Plasma cells occur in trachoma.

Epithelial cytoplasmic inclusions occur in:

1. Trachoma.
2. Inclusion conjunctivitis.
3. Lymphogranuloma venereum.

Keratinized epithelium occurs in:

1. Vitamin-A deficiency—Bitôt's spots.
2. Prolonged exposure or extreme cicatrization.
3. Keratoconjunctivitis sicca—partial keratinization, much mucus.
4. Epithelium of lid margin normally.

The cases comprising this report represent some of the average and a few of the rare and puzzling cases seen in clinical and private practice. In each instance it was felt that the information derived from tissue scrapings helped to establish or corroborate the clinical diagnosis. Treatment or prognosis was then advised with more assurance.

Chronic marginal blepharitis

Case 1. R. L. J., a veteran, first seen in November, 1948, developed a severe marginal blepharitis in 1943 which resisted continuous treatment in Army hospitals for one year. He then received a disability discharge from the Army.

Since then he had repeatedly been denied good positions as a salesman because of the unsightly appearance of his eyes resulting from redness of his lids and the abundant yellow, crumbly, and oily mucocrusts adhering to his cilia. His vision was so often transiently blurred by bits of crust and mucus that he was afraid to drive a car. He had a mild seborrhea of his face and scalp.

Expression of the meibomian glands produced abundant quantities of clear, amber colored, oily secretion. Lid-margin and conjunctival scrapings revealed many neutrophils and Gram-positive cocci. The latter was subsequently corroborated by culturing a profuse growth of nonhemolytic Staphylococcus albus.

Measures were undertaken to combat both the seborrheic and the staphylococcic components of his blepharitis. Sulfacetimide drops, one percent sulfur and salicylic-acid ointment, hot packs, and 100,000 units of vitamin A daily were ordered. Weekly meibomian massage and staphylococcus ambotoxoid injections were administered. Within two weeks his lids appeared clinically normal and have remained so to date.

Case 2. E. D. H., first seen in September, 1948, developed an infection of his lids in 1944 while in the Southwest Pacific. He was told that he had a tropical fungus infection of his eyes and received prolonged and ineffective treatment for it from an ophthalmologist and an allergist. He complained of itching of his eyes and moderate photophobia.

Examination revealed only a chronic, squamous, marginal blepharitis and some hyperemia of the conjunctiva. His skin and scalp appeared clinically normal.

A slightly increased amount of clear, oily material was expressed from his meibomian glands. Lid-margin and conjunctival scrapings presented a good number of Pityrosporum ovale, an occasional lymphocyte, and no bacteria.

Treatment with one-percent sulfur and salicylic-acid ointment, hot packs, an occasional meibomian massage, and 100,000 units of vitamin A daily gave him rapid clinical and subjective relief of his symptoms for the first time in four years.

Discussion

In Case 1, the infectious factor was clearly demonstrated by the presence of numerous neutrophils and Gram-positive cocci in the scrapings, indicating that treatment of the clinically obvious seborrheic component alone was doomed to fail.

The scrapings in Case 2 revealed the sebor-

rheic factor as the causative agent and appropriate therapeusis produced gratifying results. The ease and regularity with which P. ovale can be demonstrated in scrapings from seborrheic blepharitis was demonstrated by Gots, Thygeson, and Waisman[3] and makes positive recognition of that condition a relatively simple matter.

The large doses of vitamin A were ordered not because of a suspected deficiency thereof, but because of the beneficial pharmacologic effect of mild epithelial desquamation, particularly around the orifices of the meibomian glands, permitting freer natural drainage of these structures.

Allergic conjunctivitis

Case 3. Alice D. was seen in July, 1948, with a clinically typical, unilateral acute allergic conjunctivitis of 72 hours' duration.

There was intense conjunctival hyperemia and much ropy, elastic mucus. The eye was quite itchy. Despite the use for 48 hours of previously prescribed antistine drops, every three hours, and orally administered pyribenzamine, the eye was getting worse.

Conjunctival scrapings revealed numerous eosinophils and basophils and a few neutrophils and lymphocytes. She was advised to use the drops every hour, continue the pyribenzamine, and apply ice packs to the eye.

Within the next 24 hours there was marked improvement and in 48 hours a complete cure.

Case 4. R. L. H., seen in September 1948, received powder burns of both eyes three years previously. Since then he had had a persistent, chronic catarrhal conjunctivitis which had stubbornly resisted many forms of systemic and local therapy.

Conjunctival scrapings showed numerous neutrophils, a good number of basophils, an occasional eosinophil, and a few mononuclears; a generous sprinkling with Gram-positive cocci was also noted.

Antistine and sulfacetimide drops and pyribenzamine tablets were ordered. Within a few days his eyes became comfortable for the first time in three years. Skin tests were found to be positive to a variety of common allergens.

Discussion

In Case 3, our convictions, derived from the clinical appearance of the conjunctivitis, were bolstered by finding eosinophils and basophils in the scrapings. The decision then to intensify the anti-allergic treatment was well rewarded.

In Case 4, the previously unrecognized allergic component of the conjunctivitis was easily identified in the scrapings. The more complete type of treatment thus indicated proved to be most satisfactory.

Acute conjunctivitis

Case 5. W. P., on January 15, 1949, developed a mild catarrhal conjunctivitis of the right eye which responded satisfactorily to self-prescribed and administered collyria. On January 18th, the left eye became intensely inflamed and rapidly got worse despite the same treatment as for the right eye.

When first seen on January 19, there was a subsiding conjunctivitis of the right eye and a profusely mucopurulent conjunctivitis of the left eye. The left cornea was blanketed with minute superficial punctate staining erosions.

Conjunctival scrapings showed abundant neutrophils with many Gram-negative intra- and extracellular diplococci. Venereal disease was denied.

Alternate one-gm. doses of sulfadiazine and sulfamerazine every three hours and frequent instillations of sulfacetimide solution were ordered. Within 72 hours the cornea was completely clear and in two more days the conjunctivitis had healed.

Case 6. A. R., seen at Mt. Sinai Hospital in September, 1948, through the courtesy of Dr. H. Weiner, was being treated for a bilateral iridocyclitis complicating a nonspecific urethritis and arthritis. In addition he developed an acute bilateral purulent conjunctivitis.

Although the diagnosis of Reiter's disease seemed fairly definite, conjunctival scrapings were done as a possible guide to further therapy. As expected, many neutrophils were found, but no bacteria or inclusion bodies. Resistance to treatment was predicted and so eventuated.

Cases 7 and 8 are reported together because they were both seen at the same time during the summer of 1948 in Dr. I. S. Tassman's clinic at the Wills Hospital. Both patients were middle-aged Negresses with acute unilateral follicular conjunctivitis. Each had a medium-sized, slightly tender, preauricular lymph node. The corneas were clear.

Conjunctival scrapings presented only a few small lymphocytes. The diagnosis of acute follicular conjunctivitis, Béal, was made in each case. Resistance to treatment, with gradual spontaneous clearing in about three weeks' time, was prognosticated and so resulted.

Discussion

In Case 5 the natural tendency to try local therapy alone for another 24 hours or so, in view of the favorable response in the other eye, might have resulted in severe permanent ocular damage. The scrapings readily revealed the gravity of the situation and the need for immediate, energetic treatment.

In Cases 6, 7, and 8, the scrapings were of great aid in corroborating the diagnosis and in offering a prognosis.

Trachoma

Case 9. Mrs. R. K., a 40-year-old Armenian, was first seen in October, 1946, with the complaint of sore eyes for years. Recently her vision began to fail and, with the best correction, was found to be: O.D., 6/15; O.S., 6/9.

There was an entropion of each upper lid due to a forward convex deformity of the tarsal plates. The lid margins were thick and rounded and presented a number of misdirected, stubby cilia. The upper tarsal conjunctiva was thick and scarred and presented a moderate number of diffusely scattered fine follicles.

Presumably from the trichiasis, there were many superficial, linearly arranged, fluorescein-staining abrasions of the cornea in addition to a diffuse superficial punctate staining. A vascularized pannus extended into the superficial layers of the upper third of each cornea. A clinical diagnosis of cicatricial trachoma was made and tarsectomy was recommended.

Conjunctival scrapings revealed a predominance of neutrophils with some mononuclears and an abundance of cytoplasmic inclusion bodies in the epithelial cells. Two gm. of sulfadiazine daily and five-percent sulfadiazine ointment, four times daily, were ordered.

Within three weeks her eyes were so comfortable that she decided against the tarsectomy. She has remained comfortable to date by occasionally epilating the aberrant cilia.

Discussion

Just as Thygeson[4] emphasized in a recent comparison of acute and chronic trachoma, the abundance of inclusion bodies noted in the scrapings in this case indicated the continued activity of the trachomatous infection in spite of the evidences of chronic inactivity (the long history, the conjunctival scarring, and tarsal deformity). Not surgery but the eradication of the active infection by medical treatment was obviously the first therapeutic step.

Herpes simplex conjunctivitis and keratitis

Case 10. H. N. had had a dendritic ulcer of the right cornea, in 1937, which left a superficial vascularized nebula. On June 3, 1947, he presented a typical dendritic ulcer of the same eye. There was corneal hypesthesia. Scrapings taken from the inflamed conjunctiva revealed only a few lymphocytes.

Experimentally, 50 mg. benadryl, four times daily, were ordered, but no improvement occurred within the next three days. The ulcer was then scrubbed with strong tincture of iodine and healing with more scarring of the cornea eventually ensued.

One year later he presented himself with what appeared to be a recurrence of the condition. There were several confluent and many scattered, discrete, punctate, fluorescein-staining areas of the right cornea. Corneal sensitivity was normal.

Scrapings taken from the inflamed conjunctiva showed predominantly neutrophils. Sulfacetimide drops were ordered and the patient was discharged as cured one week later.

Discussion

The first attack after Case 10 came under our observation presented no diagnostic difficulties; even the conjunctival scrapings were typical for a herpes simplex infection. The appearance of the cornea in the last attack could conceivably have resulted from another herpetic recurrence in the moderately scarred tissue.

Doubt was cast upon this diagnosis by the normal corneal sensitivity, and the cytologic shift toward neutrophilia indicated a bacterial etiology. Therapy guided by the latter concept was most satisfactory.

Antihistaminic therapy

The experimental use of benadryl in Case 10 during the attack in 1947 calls for an explanation. The multiplicity of therapeutic procedures recommended for herpes-simplex infections of the cornea points to their individual ineffectivity.

In view of the intimate association between the virus and the susceptible epithelial cells, as evidenced by the formation of intranuclear inclusion bodies in this disease, it is not surprising that the type of treatment considered generally most successful of necessity destroys the host cell as well as the virus.

The popularly used cauterization with strong tincture of iodine and mechanical removal of the diseased area is an example of this. The postoperative discomfort, the often prolonged disability, and the usual scarring

with resultant diminution in visual acuity leave much to be desired.

Perhaps the use of aureomycin as recently recommended by Braley and Sanders[5] may help to obviate the undesirable aftermaths of this mutilating type of treatment, but their work still lacks corroboration.

Another vexing problem in herpes-simplex infections is the high rate of recurrences. Gundersen,[6] in a large series, found an average recurrence rate of 2.5 times per case over a six-year period. I have seen one case with eight recurrences and several with more than five. Obviously the local immunity stimulated by the infection itself must be short-lived. Consequently, it is not difficult to appreciate why vaccine therapy and other forms of systemic treatment have failed to prevent recurrences.

Since the ever attendant corneal hypesthesia may last for many months, and since the cornea is thus deprived of a natural means of protection from slight recurrent trauma which may light up a dormant herpetic infection, Lloyd[7] suggested protecting the eye with a shield for the duration of the hypesthesia. In 1946, Hallett and Pittler[8] reported the use of individually made acrylic moist chamber spectacles for such a purpose. Although effective in preventing frequent recurrences, when they are worn constantly, they are expensive and, in general, not acceptable to patients.

In 1947, Brewster[9] advocated the use of benadryl in the treatment of the common cold. In his report he stated that herpes-simplex infections of the lips, the common fever blisters which so often accompany head colds, were aborted along with the coryza, provided the drug was taken immediately after the appearance of the itching, burning wheal. Accordingly, antihistaminics were ordered for all cases of dendritic ulcer. No beneficial results were obtained in the well-established or late cases. One case of disciform keratitis and another of metaherpetic keratitis were similarly unaffected.

On April 27, 1948, Mr. J. L. G. presented himself with an initial attack of dendritic ulcer. The dendrite was a very early one and took the fluorescein stain in only one or two small areas. There was slight corneal hypesthesia. Subsiding herpes of the upper lid were noted. Thenylene, 50 mg., three times daily, was ordered. The patient claimed his eye felt perfectly normal two hours after the first dose. By the next day his eye was perfectly clear.

Patient W. J. J. was seen for a routine ocular examination on June 13, 1949. He had had four attacks of dendritic ulcer since January, 1946, each one, despite treatment, running a two to three weeks' course. The last attack had been in March, 1948. Herpetic lesions of the left cheek preceded each attack. The left cornea was hypesthetic and presented several peripheral superficial vascularized scars.

Pyribenzamine, 50 mg., three times daily, and antistine drops, every hour, were ordered to be used at the first sign of a recurrence.

On July 28, 1949, the cheek lesions reappeared. Therapy was started about 10 hours later when the eye became a little sore. When seen by me on August 1st, the lesions on his cheek were rapidly involuting. There was slight conjunctival injection. Only a small, irregular, linear, superficial corneal infiltrate was seen in one of the old scarred areas. Complete and rapid regression ensued.

Patient A. A. had had repeated attacks of malaria with fever blisters of his lips since 1945. On September 28, 1949, he developed herpes labialis without any fever. The following day he awakened with a burning sensation in his right eye.

When he was seen a few hours later, two small, peripheral, fuzzy, superficial-staining opacities of the cornea, with beginning dendritic configuration, were noted. Questionable corneal hypesthesia was present. Antistine drops every hour and benadryl, 50 mg., three times daily, were ordered. The next day the eye appeared completely nor-

mal but the herpes labialis was about the same.

Rabbit experiments

Since the herpes simplex virus produces a typical dendritic ulcer in the scarified rabbit cornea, it was decided to investigate the effect of antihistaminics in preventing corneal takes in that animal.

A typical clinical case of dendritic ulcer was chosen and, under pontocaine instillation anesthesia, the infected area of the cornea was curetted. The scrapings were then immediately deposited on an adult rabbit's cornea which, under pontocaine instillation anesthesia, had been prepared with three vertical Graefe-knife incisions into the superficial stroma. Within 48 hours typical branching lesions were manifested in the region of the scarifications.

With the clinical diagnosis thus corroborated, the infection was then transferred from the first rabbit to another rabbit, similarly prepared. At the same time, several drops of histadyl solution were instilled on the second rabbit's cornea and repeated in two hours. This did not prevent a corneal take in the second rabbit. Apparently local antihistaminic therapy alone is of no value.

The same procedure was then repeated from another clinical case, using fresh rabbits, with the exception that the second rabbit was given pyribenzamine intravenously (4.0 mg./Kg. body weight) two hours before and again at the time of inoculation of the cornea. This procedure completely prevented a corneal take in the second rabbit.

To date I have been unable to transfer dendritic ulcers to three other rabbits similarly protected. In one experiment the infected inoculum was simultaneously transferred to one protected and one unprotected control rabbit; the former developed no corneal infection and the latter did.

Since some domesticated rabbits acquire an immunity to herpes simplex, the protected rabbit was given a week to recover from the antihistaminic and then the opposite cornea was inoculated. A positive take resulted, indicating no natural immunity in that rabbit.

Summary

It appears that adequate systemic administration of antihistaminics prior to or very early in the course of a herpes-simplex infection of the cornea may prevent or abort the infection. Reëmphasis is placed on the fact that late or well-established infections with this virus are completely unaffected by such treatment. It is recommended, however, that antihistaminics be made available for these patients for very early administration in any subsequent recurrence.

Conclusions

1. The value of examining tissue scrapings in the diagnosis, prognosis, and treatment of certain representative types of external ocular diseases has been emphasized.

2. Tissue scrapings in herpes-simplex infections of the cornea have been used experimentally to corroborate the clinical suspicion that dendritic ulcers can be prevented or aborted by early systemic antihistaminic therapy.

16th and Walnut Streets (2).

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LIMBUS TUMORS AS A MANIFESTATION OF VON RECKLINGHAUSEN'S NEUROFIBROMATOSIS IN GOLDFISH*

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While studying a strain of goldfish in which dermal neurofibromas and neurilemomas are of frequent occurrence, it was noted that about 25 percent of the affected fish also bore tumors at the limbus. Other ocular abnormalities were likewise noted. The character of the skin lesions, as well as the presence of other stigmas, suggests a relationship of this disease in goldfish to the neurofibromatosis of von Recklinghausen in man. The general aspects of the investigation will be considered elsewhere; here we are concerned with the problem as manifested in the eyes of these fish.

Several reports of tumors arising in the eye or orbital tissues of fishes are found in the literature.[1] Among tumors of the orbit are a retrobulbar lymphoma in a flatfish,[2] as well as an orbital fibroma in a goldfish[3] and another in a cod.[4] Plehn[5] reported the case of a six-year-old tench in which the right eye was displaced by a myxoma arising at the lower margin of the orbit. The symmetrical involvement of the lacrimal bones of a codfish by chondromas has been described by Thomas.[6] A doubtful tumor of epithelial origin was found in the orbit of a small Cuban fresh-water fish.[7]

Intraocular tumors of fishes have been reported three times. In 1915, Johnstone[8] observed that the left iris of a stickleback bore a brown nodular swelling. On microscopic examination a tumor, consisting of proliferating capillaries, was found in the subcutaneous, subconjunctival, and iridial tissues.

Jahnel[9] studied a tumor he identified as a fibrosarcoma that arose in the choroid of 13 sibling swordtails, a tropical aquarium fish. The tumor was markedly invasive, infiltrated the orbital muscles, and even penetrated the skull.

Recently Levine and Gordon[10] have reported several cases of a choroidal melanoma in xiphophorin fishes belonging to species closely related to that studied by Jahnel. The neoplasms invaded the retina and later perforated the eyeball. Whether the tumor is identical with that described by Jahnel is difficult to determine, but Gordon[11] believes that it, too, occurs in fish with a common genetic origin.

MATERIAL STUDIED

The 12 goldfish (*Carassius auratus*) that provide the material for this investigation had a mean length of 30 cm. and were between three and five years of age. Eleven of the fish were obtained from a large urban pond and were reputed to be descendents of the stock placed there 20 years before. They were selected from 44 fish that bore cutaneous neurofibromas; the remaining 33 were without tumors of the limbus. Fish No. 12 was found in a garden pool only 10 feet in diameter, to which no fish had been added since it was stocked 15 years ago. Three of the 50 fish in this small pool bore cutaneous neurofibromas, but only one also presented a limbus tumor.

GROSS PATHOLOGY

The tumors were unilateral in all but one case (Fish No. 12), although in several instances early proliferative changes were present at the limbus in the other eye. Only two fish bore no tumors elsewhere on the body (Fish No. 7 and No. 10). In some fish the extraocular neoplasms were small and inconspicuous; in others they were massive. Sex differences were not apparent (table 1).

* From the Department of Pathology, College of Medicine, Ohio State University. This investigation was supported in part by a grant from the National Cancer Institute, United States Public Health Service.

TABLE 1

NEUROFIBROMAS OF THE EYE OF GOLDFISH

Fish No.	Sex	Eye Tumor	Other Tumors
1	M	Limbus of right eye, 2×1.5×1 cm.	None
2	F	Cornea of right eye, near limbus, 5×5×3 mm.	One on snout, 2×1.5×0.5 cm.
3	F	Limbus of right eye, 3×3×2 mm.	Multiple small tumors over body. 2×2×1.5 cm. pigmented tumor on left pectoral fin.
4	?	Limbus of left eye, 2×2×1 mm.	Two tumors on caudal fin, 2.5×0.5×0.5 and 2×0.3×0.5 cm.
5	M	Limbus of left eye, 2×3×2 mm.	Six tumors on tail, 1–3 cm. diameter. One on trunk, 1×1.5×0.5 cm.
6	?	Limbus of right eye, 4×3×2 mm.	Eight tumors on trunk, 1–2 cm. in diameter.
7	F	Limbus of right eye, 3×2×1.5 mm.	Five on fins, six on trunk, 0.5–1.5 cm. in diameter.
8	F	Right eye destroyed, 1.8×1.5×1 cm.	One on trunk and caudal fin. Each 3×2×0.7 cm.
9	?	Limbus of left eye, 3×4×3 mm.	One on dorsal fin, 2×1×0.6 cm.
10	?	Limbus of atrophic left eye, 5×5×4 mm.	None
11	?	Limbus of right eye, 2×3×1 mm.	One on right operculum, 6×5×3 mm.
12	M	Limbus of right and left eye. Each 4×3×2.5 mm.	Three on trunk, 0.5–1.5 m. in diameter. One on right pectoral fin, pigmented, 1×0.5 ×0.4 cm.

The tumors arose in the superior segment of the eye at the sclerocorneal junction, later growing down over the cornea (fig. 1). In one animal the tumor lay wholly within the cornea, although at its periphery (fig. 2). The majority of the lesions were small, measuring five mm. or less in diameter. Interference with vision must have been slight, particularly since the lesion seldom encroached far beyond the margin of the pupil.

In two fish (No. 1 and No. 8) the tumors were large and destroyed the eye (figs. 3 and 4). During the six months that Fish No. 8 was under observation the tumor doubled in size. The large ocular tumor of the other fish, however, grew very slowly during the five and one-half months the creature was in captivity. This slow growth is reflected in

A B

Fig. 1 (Schlumberger). *Fish No. 9.* Tumor on superior limbus of left eye. (A) Anterior aspect showing growth of tumor into upper third of cornea. Clouding of the lens is due to fixative. (B) Lateral view of eye taken before fixation, showing clarity of uninvolved cornea. (× 1.5.)

Fig. 2 (Schlumberger). *Fish No. 2.* Sharply demarcated neurofibroma arising within the cornea. A second tumor is on the snout. (Natural size.)

the negative results of attempted transplantation.

Pieces of the tumor from Fish No. 1 were transplanted to the anterior chamber of the left eye of 24 common goldfish purchased from a dealer, and into the eyes of eight goldfish obtained from the same pond as the tumor-bearing fish. No inflammatory response was noted, but all transplants were resorbed. Growth in tissue culture was also poor.

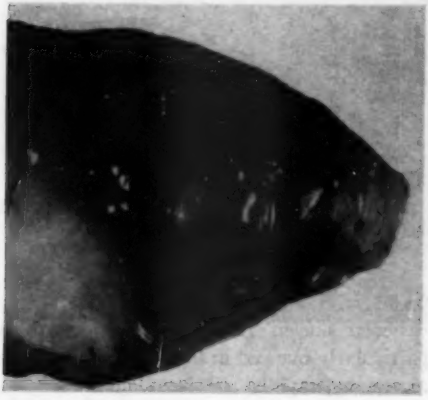

Fig. 3 (Schlumberger). *Fish No. 1.* The tumor apparently had its origin on the superior limbus, but has grown downward to infiltrate all of the cornea and enter the anterior chamber. (Natural size.)

Histopathology

The eye of teleost fishes differs in several details from that of man; only the anterior segment need be considered here. In fishes the substantia propria of the cornea is formed of two layers. The outer is a continuation of the dermis of the conjunctiva, the inner and usually thicker layer is formed by connective tissue that is a prolongation of the sclera.[12]

However, in the goldfish as in man, the cutis of the conjunctiva is present as a wedge of tissue at the limbus, only a few strands extend into the cornea itself. It is in this tissue at the limbus that the neurofibromas

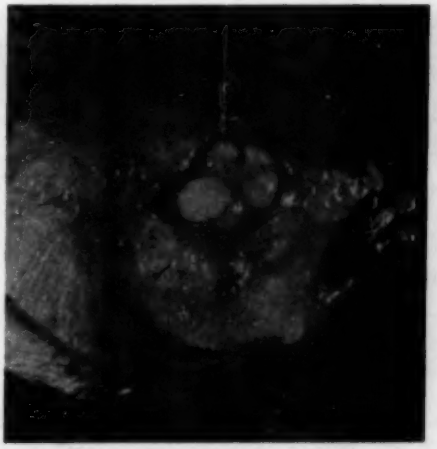

Fig. 4 (Schlumberger). *Fish No. 8.* The tumor has destroyed the bulb and filled the orbit. (Natural size.)

arise. As the tumors grow down over the cornea they occupy the position normally taken in other teleosts by the cutis of the conjunctiva (fig. 5).

The nerves of the cornea are branches of the ciliaris longus and ciliaris brevis. They form a ring-shaped plexus of medulated fibers at the limbus; some of the nerve bundles lie within the sclera, others encroach upon the cornea.[13] From this plexus arise fibers that soon lose their myeloid sheath and pass through the substantia propria of the cornea for variable distances before entering the epithelium as branching naked nerve endings (fig. 6).

Although the neurofibromas arise from the axons, Schwann cells, and connective tissue sheaths of the ciliary nerves, another group of nerves may contribute to the tumor. These are branches of the facial nerve that supply the taste buds which, in the goldfish, are scattered over the entire body surface,[14,15] including the conjunctiva.[13] In several instances these end-organs were found within the epithelium overlying the tumors.

The basic histologic pattern of the neurofibromas is one of elongate cells arranged in

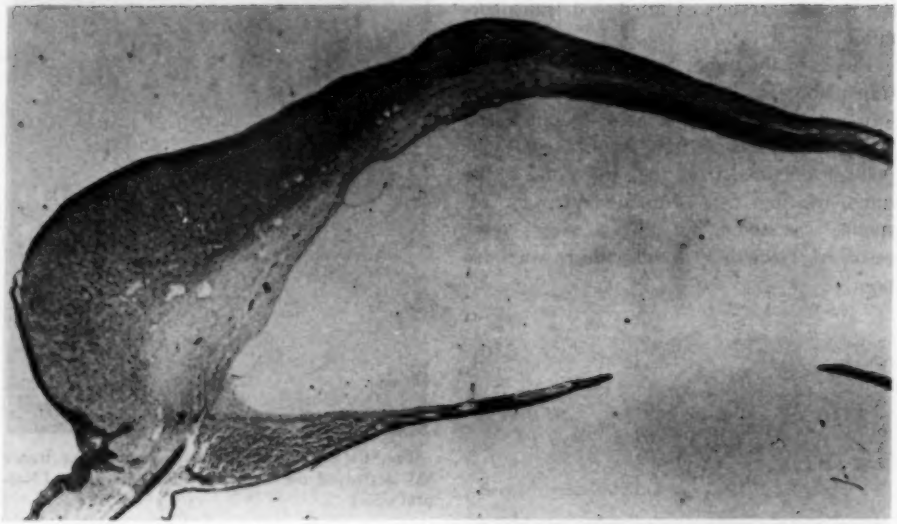

Fig. 5 (Schlumberger). *Fish No. 9.* The neurofibroma arises within the cutis of the conjunctiva and extends into the cornea, passing anterior to the main portion of the substantia propria (light). The overlying epithelium is atrophic. For gross appearance see Figure 1. (Hematoxylin and eosin stains.)

broad interlacing bundles with occasionally a suggestion of nuclear palisading (fig. 7). This latter feature is never prominent in the limbus tumors, although several growths elsewhere on the body of the fish may show classic examples of the phenomenon, permitting their classification as neurilemomas.

Besides the elongate cells, there may be rather extensive areas in which the cells are broad with abundant cytoplasm and large vesicular nuclei. This pattern of growth is particularly marked in those tumors that are increasing rapidly in size. The nuclei are often bizarre and pleomorphic, with prominent nucleoli; occasional mitotic figures are

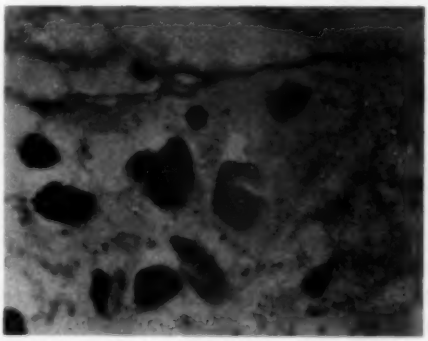

Fig. 6 (Schlumberger). Naked nerve fiber leaving substantia propria of cornea and branching as it enters the epithelium. Normal goldfish cornea. (× 700.) (Bodian silver stain.)

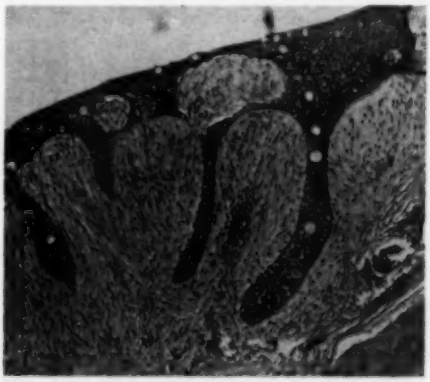

Fig. 7 (Schlumberger). *Fish No. 6.* Small neurofibroma at limbus composed of proliferating Schwann cells. Note the long epithelial pegs, mucous cells in epidermis, and the anterior tip of the scleral cartilage. (×62.5.) (Hematoxylin and eosin stains.)

seen (fig. 8). Nevertheless, the whorled pattern and even a suggestion of nuclear palisading persist. Although these lesions present the histologic features of a malignant tumor, none have metastasized. Similar changes have been observed in human neurofibromas.[16]

Special stains reveal few collagenous fibers in the stroma of the neoplasms. Silver impregnation shows the presence of numerous delicate parallel reticulin fibers (fig. 9)

Fig. 8 (Schlumberger). *Fish No. 1.* The large pleomorphic nuclei and darkly staining cytoplasm suggest malignancy. For gross appearance see Figure 3. (× 125.) (Hematoxylin and eosin stains.)

and occasional axons (fig. 10). The ability of normal or neoplastic Schwann cells to lay down reticulin has been demonstrated in tissue culture by Murray and Stout.[17]

The degree of vascularity of the tumors is inconstant, some regions may appear quite avascular, while others are traversed by many dilated vessels with walls composed only of endothelium. The overlying stratified squamous epithelium and its contained goblet cells is atrophic, although long epithelial pegs often extended far into the neoplasm. This acanthosis is particularly true of the very small lesions; in one instance the epithelial peg had almost separated from the epidermis and had produced a small cyst.

Additional ocular anomalies

Examination of the goldfish from this

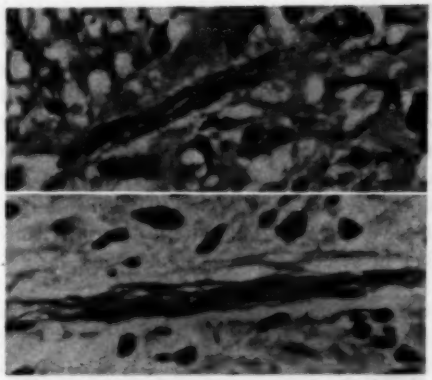

Fig. 9 (Schlumberger). Delicate parallel reticulin fibers in neurofibroma of limbus. Many of the fibers appear to be in intimate relation with the Schwann cells. (× 250.) (Bodian silver stain.)

pool disclosed a surprising number of ocular abnormalities. The fish are not an exotic variety, no unusual tail forms or body shapes were noted, and the resemblance to the close-

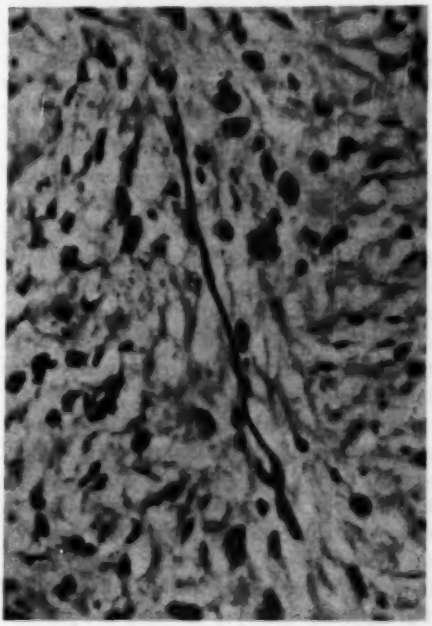

Fig. 10 (Schlumberger). Nerve fiber (neurite, axon) in limbus tumor. The fiber is single and coarser than those of reticulin in Figure 9. (× 400.) (Bodian silver stain.)

ly related carp is striking. Although in the common goldfish the cornea is quite flat and the anterior chamber is very shallow, 20 to 30 percent of the fish in the pool showed evidence of keratoconus. The anomaly was usually bilateral, the apex of the cone directed nasally, the cornea clear, and the anterior chamber very deep. Twice a dislocated lens was found in the anterior chamber in association with keratoconus.

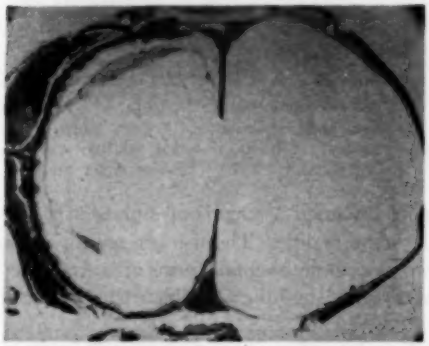

Fig. 11 (Schlumberger). Eye of goldfish showing buphthalmoslike deformity. Note thinning of cornea and marked increase in depth of anterior chamber. (× 4.) (Hematoxylin and eosin stains.)

In three fish there was bilateral exophthalmos with enlargement of the eye and greatly increased depth of the anterior chamber. The central portion of the cornea in these eyes is thin, the iris appears less thick than normal (fig. 11). Although a canal of Schlemm is not present in the eyes of fishes and no abnormality of the filtration angle is seen in these cases, the condition closely resembles buphthalmos in man.

Annular posterior synechias, occasionally associated with keratoconus, were found several times. In a series of 48 fish, seven had suffered disorganization of one or both eyes with subsequent atrophy. The presence of synechias or of phthisis bulbi would indicate a previous acute inflammation. Furthermore, the eyes of fishes are particularly liable to injury by floating objects and by parasites. Nevertheless, such a high incidence of ocular abnormalities is not found in goldfish from other pools. The sunfish, bass, and pike in the same pond with the affected goldfish had normal eyes.

The eye of goldfishes is subject to wide variations, as witness the "telescope eye" strain. This genetic lability may account for the frequent association of ocular anomalies with the presence of neurofibromas elsewhere in the body. The common occurrence of cataracts and fixation of the pupil by synechias has also been noted in specimens of the "telescope eye" strain that is commercially available.[18]

Keratoconus or other marked deformity of the cornea has very little effect upon the visual acuity of the afflicted fish. This is due to the refractive index of the cornea, which is so nearly that of water as to eliminate its focusing power.[13] The teleost eye also differs from that of higher vertebrates in the absence of a secretory ciliary epithelium. The lack of a ciliary process may give an erroneous impression of atrophy.

It is suggested by Walls[12] that the source of anterior-chamber fluid in the fish is the surrounding water, which passes through the cornea by osmosis. Drainage is by way of the ocular blood vessels. Buphthalmos in the goldfish may be related to congenital thinning of the cornea with consequent easier distensibility and increased flow of water through the cornea into the anterior chamber. Interference with venous or lymphatic drainage by neurofibromas or other blocks was not demonstrable.

Discussion

The manifestations of von Recklinghausen's disease in the orbit and globe of man have received considerable attention during recent years. Of these the most common is a plexiform neurofibroma of the upper lid.[19] Koeppe[20] has identified thickenings seen on corneal nerves with the slitlamp and corneal microscope as small neurofibromas. However, neurofibromas of the

limbus similar to those seen in the goldfish are seldom found in man,[21] although so common in the phylogenetically related lid. Also of interest is the fact that in man the upper lid is much more frequently affected than the lower. In fish, too, the upper (dorsal) segment of the limbus is first involved by the neoplasm, which then gradually encircles or infiltrates the cornea.

Orbital tumors arising from the ciliary nerves[22] and primary tumors of the optic nerve, usually gliomas, are phenomena of human neurofibromatosis.[23] Occasionally, these peripheral tumors are accompanied by gliomas of the brain. Examination of the orbital contents and optic nerves of fish bearing limbus tumors failed to disclose any neoplasms. Only three brains were step-sectioned for histologic study; all were apparently normal.

Recently the occurrence of primary optic atrophy in von Recklinghausen's disease was reported by Dresner and Montgomery.[24] Plexiform neurofibromas involving the choroid and ciliary body[25] are recognized features of this disease, as are also melanosis uveae and melanoma of the iris.[26]

Conclusions as to the significance of melanosis in the eye of goldfish must be very circumspect in view of the frequent accumulation of melanoblasts at the site of inflammation in these animals. In several eyes that bear limbus tumors there appears to be a definite heaping up of melanoblasts in the iris, resembling the benign melanoma of that structure in man. Melanosis of a large area of the cornea was seen twice in fish with limbus tumors.

The studies of Reese[27] on malignant pigmented tumors of the uvea that resemble neurilemomas are of interest in this connection. One of these was accompanied by a fusiform pigmented overgrowth of the Schwann cells surrounding the long ciliary nerve. A similar relationship may exist between the limbus tumors of these fish and the collections of melanoblasts in the iris and cornea. The melanoblasts, like the Schwann cells, are neural crest derivatives.

A number of human cases have been reported in which buphthalmos accompanied a neurofibroma of the eyelids or orbit.[28] Several tumor-bearing fish, as already noted, displayed ocular changes comparable to those of keratoconus or buphthalmos in man. However, atrophy of the iris and retina could not be demonstrated. The large eyes of "telescope eye" goldfish closely resemble the abnormal eyes of these fish and likewise show no atrophy of the retina.[29] The nature of the interrelationship of the ocular changes and systemic neurofibromatosis remains to be elucidated in both man and the goldfish.

Summary

1. Neurofibromas of the limbus have been observed in 12 goldfish; all but one of the fish were from the same pond. In addition to the limbus tumors 10 fish bore neurofibromas and/or neurilemomas on the trunk and fins.

2. Ocular abnormalities, among which keratoconus and buphthalmos are prominent, are found among the goldfish in this pond.

3. A relationship of this disease complex in goldfish with that of von Recklinghausen's neurofibromatosis in man is considered probable.

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THE ACCOMMODATIVE-EFFORT SYNDROME: PATHOLOGIC PHYSIOLOGY*

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The purpose of this first report is to present the pathologic physiology of an important clinical entity. These reports are based on three years of research on the relationship of accommodation and convergence. While there have been many academic and theoretical phases to this study, the primary objective of this series of reports is to present methods of diagnosing and effectively treating a common disorder of near-point muscle balance which has been designated as the accommodative-effort syndrome. These methods are based upon a fundamentally different concept of the physiologic relationship of accommodation to convergence than that which has been generally accepted.

The nasalward deviations of the two eyes (bilateral adduction) for the purpose of effecting the bifoveal fixation of a near object of regard has two main physiologic components (fig. 1). This over-all act is generally known as convergence.

One of these components, accommodative adduction, is a phylogenetically inherited reflex. The act of accommodation in infancy seems invariably accompanied by a quantitatively proportionate amount of bilateral adduction (fig. 2).

Normally this adduction serves the useful purpose of so aligning the visual axes that they are coördinate with the dioptric distance† for any given visual task; that is, the visual axes will intersect at or near the object of regard when the corresponding accommodation is activated for the object. This congenital reflex, therefore, facilitates development of the fusion mechanism.

	Differential of Accommodative Abduction	True Convergence
Type of reflex	phylogenetically inherited	learned (conditioned)
Type of movement	gross adjustment	fine adjustment
Purpose	facilitate convergence (fusional) development	effect and maintain bifoveal position
Sensory stimulus	accomodative effort	retinal disparity
Bilaterality	only monocular stimulus necessary	binocular stimulus necessary
Effect on accomodation	direct reciprocal stimulation (inherited)	indirect reciprocal stimulation (conditioned association)
Response to training (conditioning)	none (relative to stimulus)	great (relative to stimulus)
How measured clinically	fusion-free state	fusional state
State of accomodation during measurement	Dynamic	Static

Fig. 1 (Hill). Physiologic relationship of accommodation to convergence.

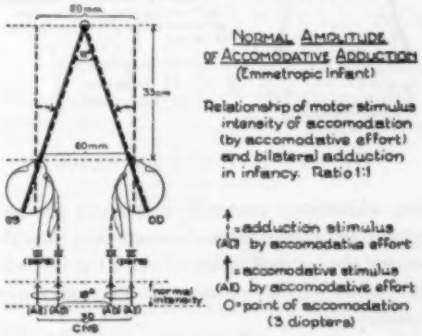

Fig. 2 (Hill). Accommodative adduction is a phylogenetically inherited reflex.

Fusion is the cerebral integration into a single mental impression of similar visual sensations arising from corresponding retinal areas of the two eyes. Fusional movements would use accommodation in excess of the dioptric distance, and myopes would use less.

* From the Department of Ophthalmology, University of Oregon Medical School. Part of a study being aided by funds from the Oregon State Elks Association. Read at the eighth annual meeting of the American Association of Orthoptic Technicians, Chicago, October, 1949.

† "Dioptric distance" is the reciprocal of the distance in meters of an object from the eyes. In the emmetrope this is equivalent to the amount of accommodation used for any given visual task; for example, the dioptric distance of an object 33 cm. distant from this patient is 3.0D., which is also the amount of accommodation used. Hypermetropes

are learned dysjunctive movements of the eyes stimulated by binocular retinal disparity, which serve the purpose of eliminating this disparity and thereby permit normal fusion.

In brief, the inherited reflex (accommodative adduction) normally eliminates the necessity for gross fusional movements, thus allowing the learned reflex to make the fine adjustments of the visual axes necessary for fusion.

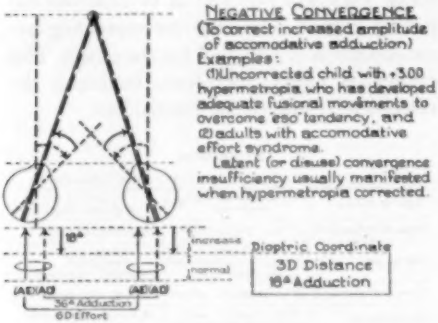

Fig. 3 (Hill). Negative convergence.

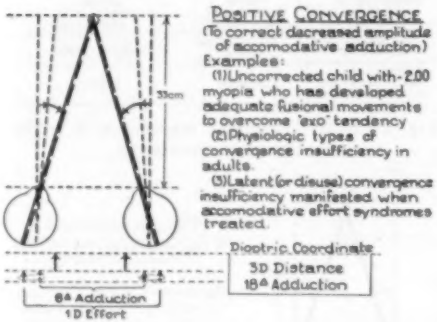

Fig. 4 (Hill). Positive convergence.

Excessive or insufficient accommodative adductions require a more gross adjustment by the fusional movements in order to effect and maintain the bifoveal position for the object of regard (figs. 3 and 4). In infancy, before fusion and fusional movements have had an opportunity to develop to any effective degree, these situations may result in exotropia or esotropia, in accordance with Donder's principles (fig. 5). Adults who have acquired an effective degree of fusional movements to overcome these excessive or insufficient accommodative adductions may have asthenopic symptoms, due to excessive demands upon these fusional movements.

It should be stressed that accommodative adduction may occur in the absence of fusion. In fact it is by the comparison of the fusion-free positions of the visual axes in different states of accommodative effort that the amplitude of accommodative adduction is determined* (fig. 6).

The "accommodation-adduction coördinate" has two components, as indicated by the term. When both are indicated the term "dioptric coördinate" will be used.

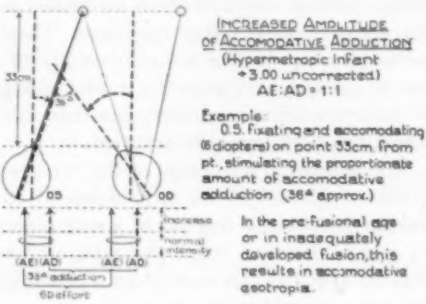

Fig. 5 (Hill). Increased amplitude of accommodative adduction.

The direct stimulus to this fusion-free accommodative adduction is accommodative effort,[1] and not the amount of accommodation,

* The amplitude in this case refers to the total deviation of the visual axes expressed in terms of prism diopters. It is obtained by algebraically summating the distance and near phorias to the normal adduction coördinate at near. Letting distance XO be (+) and near XO (−), then, accom. × p.d. (cm.) + (distance phoria + near phoria) = amplitude of accommodative adduction:

Example—distance = XO 6Δ
near (33 cm.) = XO 2Δ
pt's p.d. = 6 cm
(accom. × p.d.) + (dist. phoria + near phoria)
(3× 6) + (+6+(−2)) = 22Δ amplitude accommodative adduction

per se. This effort bears a 1:1 ratio† with the quantity of accommodation used in infancy, but usually does not retain the same ratio in adulthood.

The ratio of the quantity of accommodation used to the quantity in reserve (amplitude) also changes throughout life because a continuous loss of accommodative amplitude occurs normally, although the adduction coördinate‡ remains essentially unchanged. Accommodative effort appears to retain its constant quantitative stimulatory relationship (fig. 6). This is characteristic of a phylogenetically inherited reflex.

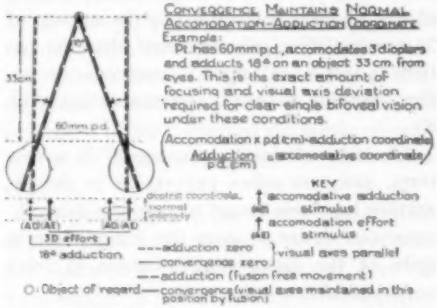

Fig. 6 (Hill). Convergence maintains normal accommodation-adduction coördinate.

The other main component of the over-all act of convergence is that movement which effects the finer, more accurate adjustments of the visual axes. The general term is fusional movement. In the strictest sense, inasmuch as it is the only true fusional component of the act of convergence, it should be termed "true convergence"

It may be "positive" or "negative," depending upon whether the fusional adjustment is convergently toward or divergently

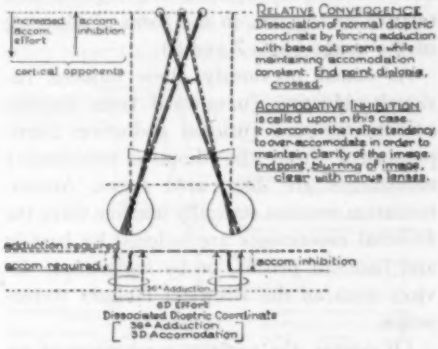

Fig. 7 (Hill). Action of associated, learned reciprocal reflexes.

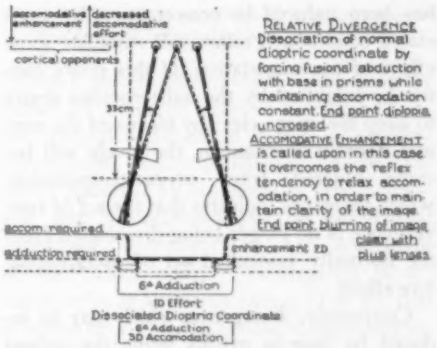

Fig. 8 (Hill). Action of associated, learned reciprocal reflexes.

toward the normal dioptric coördinate for a given state of "convergence."

(Relative convergence and divergence would be improper terms since they connote a dissociated, or movement away from the normal dioptric coördinate. Convergence and divergence alone would likewise be improper for the same reason.)

In infancy, fusional movements appear to bear no direct relation to accommodative ef-

† The 1:1 ratio in this case refers to the normal accommodative coördinate for any given visual task; for example, 3.0D. accommodation would result from 3.0D. accommodative effort (which would in turn be mirrored by 18^Δ of fusion-free adduction in pt. with 60 mm. p.d.).

‡ Adduction coördinate for a given dioptric distance is the amount of adduction in prism diopters from the parallel position required to cause the visual axes to intersect at that distance. It is determined by the product of the dioptric distance and the p.d. in cm.

fort, but their continued concurrent action with accommodative adduction results in strongly associated, learned reciprocal reflexes. These associated, reciprocal reflexes are clinically significant, and can be normally elicited by relative convergence and relative divergence, in the form of blurring of the image (figs. 7 and 8).

As stated previously, these induced fusional adduction (nasalward from dioptric coördinate) and fusional abduction (temporalward from the dioptric coördinate) movements are dissociated states. Accommodation remains statically inactive while the fusional movements are induced by base-in and base-out prisms, or by haploscopic devices such as the Brewster-Holmes stereoscope.

Of course, the nervous mechanism of accommodation cannot remain completely inactive, for the mere act of adduction which has been induced by convergence, by associated conditioned reflex will stimulate some effort of accommodation. If this reflex cannot be inhibited by the subconscious desire to keep the image clear by means of the normal nervous mechanism, the image will become blurred from overaccommodation, which therefore indicates that the act of convergence is no longer being dissociated from the normally associated act of accommodative effort.

Conversely, divergence, which may be induced by base-in prisms while the patient is accommodating to a near point, will stimulate relaxation of accommodative effort by reason of a reciprocally, learned, associated reflex. It is reasonable to suppose that (and recent experimental evidence appears to substantiate this view) the reciprocal phase of accommodation—adduction, which is de-accommodation-abduction, is also an inherited reflex. It is possibly mediated in part by sympathetic stimuli to Brucke's muscle.

Similarly as the learned, associated reflex of convergence-accommodation is developed, the divergence phenomenon, once learned, becomes intimately tied up with the corresponding stimulus to relax accommodation. Therefore, when divergence is induced, as with base-in prisms at near, there will normally result a tendency to relax accommodation, which is probably mediated by the associated act of abduction.

If the subconscious desire to keep the image clear in spite of the reflex stimulus to relax accommodation fails, blurring of the image occurs. Thus, the blurring of the image induced by divergence at near is a normal phenomenon, and simply represents the limit of divergent dissociating accommodative ability which is determined by the amount of "accommodative enhancement" that the patient is able to call upon to overcome the reflex stimulus to relax accommodation (fig. 8).

"Accommodative enhancement" is a new term, since no other expression in the literature has been found to describe this subconscious desire to keep the image clear in spite of the dissociating stimulus to relax accommodation.

Relative positive accommodation may be a good index to the amount of "accommodative enhancement" present in a given patient, but the terms are not synonymous, since in the former case accommodation is dynamically active, and in the latter it remains static.

Similarly, "accommodative inhibition" can be used to designate the cortically mediated phenomenon to prevent overaccommodation which is stimulated reflexly by convergence dissociation.

An understanding of these cortical opposing forces in induced states of dissociation is essential to the explanation of a pathognomonic sign of excessive accommodative effort, that is, abnormal base-in blurring at the near point (abnormal relaxation of accommodation induced by relative divergence at near) (fig. 9).

If excessive effort of accommodation is

used for a given near-point visual task, there will be a corresponding (and quantitative) increase in the stimulus to adduction, which in turn requires negative convergence in order to effect the normal dioptric coördinate. This fusional abduction, by reciprocal reflex action, stimulates a tendency to relax accommodation, which utilizes much of the normal reserve accommodative enhancement. Very little more fusional abduction, such as is induced by base-in prisms, is then necessary to exceed the remaining enhancement reserve, and blurring of the image occurs.

That the blurring is due to excessively relaxed accommodation is easily demonstrated by the use of plus lenses at this instant, which immediately clears the image. That the blurring of the image is also primarily due to depletion of accommodative enhancement is evidenced by the decreased amplitude of relative positive accommodation in these cases (fig. 9).

The physiologic chain of events leading up to this abnormal relaxation of accommodation induced by base-in prisms at near, in accommodative effort syndrome cases, may also be deduced in another manner. An increased state (or "potential") of accommodative inhibition occurs whenever there is depletion of accommodative enhancement, and vice versa, since these phenomena are cortical opponents and are normally in balance.

Thus the increased state of accommodative inhibition which was present as the result of the depletion of the normal accommodative enhancement reserve becomes manifest by blurring of the image when a small amount of base-in prism is added.

The significance of this abnormal blurring induced by relative divergence at near cannot be over-emphasized since it is pathognomonic of increased accommodative effort, and is not a measure of vergence.

Latent convergence insufficiency is also an important characteristic of the accommodative effort syndrome. Failure to recognize this factor accounts for a large number of unsuccessfully treated anomalies of accommodative function and for a large number of wrong diagnoses of convergence insufficiency. Its latent existence in all cases of accommodative effort is accounted for by the same mechanisms which precipitate the other typical signs of accommodative effort.

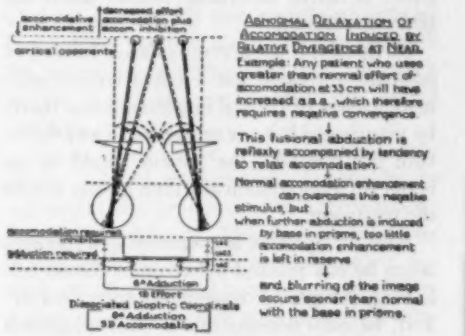

Fig. 9 (Hill). Abnormal relaxation of accommodation induced by relative divergence at near.

When a patient has excessive adduction by reason of increased effort of accommodation, the corrective movement is that of negative convergence (fusional abduction) at the fixational pauses if an esophoria at near is present, and a decreased positive convergent movement regardless of his near-point phoria.[2] Thus positive convergence is not called upon to the same extent, if at all, that it would be in a patient without increased accommodative effort.

This may also be called a convergence insufficiency of relative disuse, since too much of the adduction load for near vision is effected by the phylogenetic reflex of accomodative adduction, and too little by the learned reflex of true positive convergence.

Any learned reflex, of course, suffers by disuse, similarly as it is enhanced by repeated use. So the origin of this latent convergence insufficiency is apparent when the physiologic difference between accommodative adduction and true convergence is studied.

The convergence insufficiency becomes immediately apparent when the increased accommodative effort is relieved by one of the several mechanisms previously mentioned. It may or may not be of sufficient proportions to cause asthenopia when manifested, but a diminished convergence reserve from that present when the increased accommodative effort is active invariably results when the latter is relieved.

Obviously, if the accommodative effort was adequately treated but a latent convergence insufficiency of clinical importance was thereby manifested but not recognized (and therefore not treated), the patient would be no better off symptomatically than he was before the treatment.

Also, if a patient is examined at a moment when he has relaxed his accommodation following fatigue of continuous increased effort, he may demonstrate a wide exophoria and a true convergence insufficiency at near —and if the real origin of this convergence insufficiency is unrecognized, he may be given the wrong treatment of relative convergence exercises, which tend to aggravate the accommodative anomaly by reflexly further stimulating an already embarrassed accommodative action.

This latent convergence insufficiency should therefore clearly differentiate this syndrome from the frequently misused term of "convergence excess."

The accommodative-effort syndrome consists of:

1. Asthenopia with near vision, usually coming on within a few minutes after reading, sewing, and so forth.
2. Increased amplitude accommodative adduction.
3. Abnormal relaxation of accommodation induced by relative divergence at near (prism base-in blurring at near).
4. Latent convergence insufficiency.
5. A measurable abnormality of accommodative function.

Patients with the accommodative-effort syndrome usually go undiagnosed from doctor to doctor, receiving new glasses or orthoptic training, but no relief from symptoms. Many are diagnosed as psychoneurotic, and others actually become so eventually if they fail to get relief. Conversely, they are most grateful when successfully treated.

Proper and adequate treatment, of course, depends upon a proper diagnosis, which, in turn, depends upon a thorough knowledge of the pathologic physiology, since there are numerous etiologic types.

So much has been written on the relationship of accommodation to convergence and its various pathologic variations, that it seems rather odd that no one has apparently put together some of the known clinical and experimental data in the form of a clear-cut clinical syndrome which can be identified in any case of uncompensated accommodative effort, regardless of its origin. The etiology may be varied such as accommodative paresis, accommodative fatigue, presbyopia, and hypermetropia.

This syndrome exists only when the patient with the anomaly of accommodative function actually uses excessive accommodative effort for any given visual task. Thus, many patients with accommodative anomalies find by experience that close work causes blurring, headaches, and so forth, and simply avoid such visual tasks completely, or they stop short of developing these symptoms; thus, they do not manifest the syndrome until the accommodative mechanism is provoked to the point of producing excessive effort.

Others with abnormal accommodative function may have the defect fully corrected by the proper prescription of reading glasses, and thus have no accommodative-effort syndrome unless they try to read without these corrective glasses.

Conversely, even patients with a normal accommodative mechanism may demonstrate the typical accommodative-effort syndrome

when they are recovering from a cycloplegic drug if they try to do close work too soon after the drug was used. In this event, they will have the asthenopia with near vision, increased amplitude of accommodative adduction, abnormal base-in blurring at near (pathognomonic), and a measurable abnormality of accommodative function, albeit a temporary one. The syndrome disappears as soon as the effects of the cycloplegic drug wear off.

Many persons find that simply holding the reading material further way from them suffices to clear up asthenopic symptoms, typically in early uncorrected presbyopia, and others will further relieve accommodative effort by using the "depth of focus," allowing the print to be slightly blurred, but usually not enough to cause conscious awareness of it. This also occurs typically in the early presbyope, or insufficiently corrected presbyope.

It is apparent, then, that the mere presence of an abnormality of the accommodative function does not in itself establish the diagnosis of accommodative effort syndrome, but only the potentiality for it, for there are a number of compensating mechanisms to prevent this excessive effort, many of which are learned by the patient and some of which are prescribed by the ophthalmologist.

On the other hand, any patient who is using excessive effort to accommodate at the time of examination will invariably have the pathognomonic signs of deficient accommodation of divergent dissociation (base-in blurring at near point) and increased amplitude of accommodative adduction. If a patient who suffers from the accommodative effort syndrome does not demonstrate these diagnostic signs at the time of examination, it simply means that at that particular moment he is not using excessive effort of accommodation.

Certain provocative tests, however, will invariably uncover these two diagnostic signs if the typical symptoms of asthenopia at near (only) and a measurable abnormality of accommodation are elicited. The most effective of these provocative tests merely consists of keeping the patient under observation until the near-point symptoms develop, at which instant it will be easy to elicit the typical findings.

As in many other phases of medicine, single, isolated examinations frequently do not reveal the presence of the accommodative-effort syndrome. This is especially true of the etiologic type of accommodative fatigue of "ill-sustained accommodation."[3] Recovery from the fatigue state in accommodation is notoriously rapid so that, if such a patient is allowed to recover before examining him for signs of increased effort of accommodation, no positive findings may appear at that moment.

A patient who complains of asthenopic symptoms after a variable time at near work, and who has an abnormality of accommodative function, such as decreased amplitude for age, or abnormal dynamic action, and so forth, will, if examined at the moment he develops his symptoms, almost invariably demonstrate the typical signs already outlined.

This first report has covered only the pathologic physiology of the accommodation-effort syndrome. Subsequent papers will cover other phases in detail.

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Discussion

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Dr. Hill approaches the problem of the patient with asthenopic symptoms from an entirely new viewpoint. Since he has introduced new terminology into the ophthalmic nomenclature, it may be confusing to those of us who have been reared on the teachings of Duke-Elder, Bielschowsky, Burian, Adler, Lancaster, and others. However, it behooves us to consider with an open mind the new viewpoint that has been presented to us.

Since we have been taught that versions are conjugate movements, vergences are dysjunctive movements, and ductions are movements of one eye independent of the other, the term "bilateral accommodation adduction" rather than "convergence" may be new to us. Since convergence is not the result of stimulation of retinal elements and therefore one can converge when both eyes are covered and no retinal stimulation occurs (and therefore no accommodation), this reflex can be performed without accommodation.

Dr. Hill feels that "bilateral accommodation adduction" means, as I understand it, a nasalward deviation of the eyes, which necessitates a contraction of the internal rectus muscles but is associated with accommodation and that it occurs before fusional movements—that is, stimulation of retinal elements on corresponding areas.

Duke-Elder (Textbook of Ophthalmology, St. Louis, Mosby, 1949, v. 4, p. 3793) states: "The convergence reflex is activated by proprioceptive impulses initiated by the contraction of the two internal recti; the path of the afferent fibers is unknown; they may travel up the ophthalmic division of the 5th nerve, but more probably ascend the 3rd nerve itself to reach the mesencephalic root of the trigeminal; thence a relay is made to Perlia's nucleus, whence connection is made with the Edinger-Westphal nucleus.

"The accommodation reflex is activated in the retina; the afferent fibers travel up the optic nerve, the chiasma and tracts; they are relayed in the external geniculate body, whence a further neuron travels to the calcarine cortex and thence a relay is made to the peristriate area. Fom this region the reflex paths travel down the occipito-mesencephalic tract to reach the midbrain and Perlia's nucleus, whence again connection is made with the Edinger-Westphal nucleus.

"Of the two reflexes the convergence reflex is the more potent. Although the two constituents of the near reflex usually summate to produce pupillary constriction, it has been shown conclusively that each element may function physiologically without the other when either convergence or accommodation has been eliminated by prisms or lenses. Thus in cases of blindness, voluntary convergence produces pupillary constriction and in progressive muscular atrophy when convergence is abolished, accommodation for a near object is accompanied by pupillary constriction."

From this I deduce that what Dr. Hill terms "bilateral accommodation adduction" is what most of us as orthoptic technicians at least, have called the "accommodation-convergence reflex."

I agree with Dr. Hill that, if a patient, who has hyperopia, relaxes his accommodation as a result of fatigue or continuous effort during the testing period, and manifests a wide exophoria at the near point because he has dissociated his convergence and accommodation, is given relative convergence exercises, the orthoptic result will be failure.

If he is given relative convergence exercises designed further to relax his accommodation, he therefore manifests a convergence insufficiency. If he overly exerts his accommodation, the convergence insufficiency may not be present during the testing period.

Since this patient has an abnormal relationship between accommodation and convergence, he becomes fatigued as he exerts accommodation beyond the normal amount in order to secure adequate convergence. He therefore relaxes accommodation at intervals and when he does, images blur because of inadequate accommodation and inadequate convergence. His temporary solution is to hold his book a little further away which requires less effort of accommodation and of convergence.

These symptoms more often are found in the early presbyope or the undercorrected presbyope and as Dr. Hill points out, are often relieved simply by the proper refraction. When the correct lenses do not relieve the symptoms, proper orthoptic training may do so.

In our experience, training must be directed toward a balanced relationship between accommodation and convergence, correction cannot be made by means of exercises with the use of prism base-out on a light, a white-headed pin or the finger, since it is not necessary to exert much accommodation to keep these objects clear and convergence may be therefore more excessive than accommodation and the balance still remain unaltered.

These particular exercises have their place in the treatment of stimulating the convergence but are only the first step in the treatment.

The major amblyoscope, stereoscope, or any instrument employing detailed and stereoscopic fusion targets must be used to stimulate and control accommodation at a constant level, when the convergence is being relaxed or stimulated, in order to establish a high convergence ratio to the accommodation.

In another group of hyperopic patients, excessive effort of accommodation is used when the hyperopia is uncorrected, and therefore excessive convergence is manifested. Inhibition of the excessive convergence is then taught to them. If these patients inhibited the accommodation instead of the convergence, the images would be blurred.

For the last 10 years we have taught these patients (whether the abnormal relationship results in an accommodative esophoria or an esotropia) first to dissociate the convergence from the accommodation in order to break up an abnormal-habit reflex. Such treatment can be taught easily to intelligent five-year-old children and to adults, although success with the adult group depends upon the degree of the existing hyperopia and the power of accommodation.

When the patient can consciously dissociate the convergence from the accommodation, he is then taught to accommodate the desired amount to clear his images and inhibit excessive convergence. Our orthoptic aim is never to inhibit the accommodation. This is a learned process and my interpretation of Dr. Hill's term "accommodative enhancement." Since most patients who are treated orthoptically in this manner are children or adolescents, asthenopia is rare.

In childhood, in an uncorrected hyperope, if the relationship between accommodation and convergence throws too great a burden on the mechanism and it is too great an effort constantly to fuse two images, the individual merely gives up the attempt for fusional convergence, adducts one eye, suppresses it, and accommodates the desired amount to keep the image of the fixing eye clear. Such an act, in my opinion, could be termed "accommodation adduction" since he is adducting one eye while he is accommodating. When he is not accommodating he does not adduct one eye. If the fusion sense is so strong that he cannot arrive at comfort so easily, then the position of his eyes will be esophoric and there may or may not be symptoms.

Since this is Dr. Hill's first report on "The accommodative-effort syndrome" and subsequent papers are to be published, I await with interest his detailed accounts of the techniques we will be able to employ clinically in our investigation of this interesting subject.

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INTRAOCULAR BIOPSY

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Aspiration of fluid from ocular cysts is not rare but the removal of tissue from an intraocular tumor for examination has not been described. For this reason the following case report, which I believe to be unique, is being presented.

Case report

History. An adult man, C. P., aged 71 years presented himself for refraction in June, 1948. His chief complaint was monocular double vision in the left eye—one image appearing higher than the other. He had been refracted six weeks previously without relief of his complaint. Visual acuity with glasses was: R.E., 6/5, J2 at 14 inches; L.E., 6/15, J10 at 14 inches.

It was impossible to improve the correction he was wearing. The examination of the right eye revealed no pathologic condition. Because of a shadow which was visible in the lower part of the left eye behind the lens, the eye was studied with a dilated pupil. Examination with ophthalmoscope and slit-lamp, direct illumination and transillumination, revealed:

Slitlamp examination. There were scattered lenticular opacities and the suture lines in the lens were visible. In the 6-o'clock meridian, below the pupil, a mass was visible with a crescentic upper border, convex upward, apparently located directly behind the lens. On direct inspection the mass appeared somewhat pigmented.

By oblique illumination it appeared fleshy and yellowish with some small blood vessels visible on the surface. By retro-illumination it appeared black against the red reflex of the fundus. With the transilluminator directly below the mass it appeared translucent.

The tension was 18 mm. Hg (Schiøtz).

Because of the translucent appearance the question arose whether the mass was a benign cyst or a slightly pigmented malignant tumor. It was decided to attempt aspiration to clarify the diagnosis.

Operation. Under local anesthesia, a meridional incision was made in the conjunctiva at the 6-o'clock position, the conjunctiva was undermined laterally, and separated. Three markedly dilated superficial scleral vessels were encountered. These were sealed by diathermy. A small incision partly through the sclera was made with a Graefe knife.

A tuberculin syringe with a No.-24 needle was then introduced into the mass with a rotary boring motion. That the needle was in the tumor was substantiated by the mass moving from side to side when the needle was oscillated. On suction no fluid appeared. After withdrawing the needle there was a minimum amount of slightly blood-tinged moisture in the syringe, possibly aqueous from an aqueous vein. This was blown on a slide, dried and stained. It was found that the needle had drilled out a core of cells.

Pathologic report. Dr. George A. C. Snyder of the Deaconess Hospital, Spokane, Washington, submitted the following report:

Immediate smear preparations stained with Terry's polychrome methylene-blue reveals some red cells, lymphocytes, and a mass of highly cellular tissue composed of fusiform cells having rather large dark-staining nuclei and enlarged nucleoli. No definite mitotic figures are encountered. Pathologic diagnosis: Sarcoma.

To substantiate the diagnosis of tumor there were the following facts: (1) Neoplasm is much more frequent than cyst; (2) the enlarged scleral vessels were indicative of tumor; (3) absence of fluid on

aspiration; (4) the mass did not collapse on aspiration; (5) the mass moved with the needle, indicative of being solid; (6) the cells encountered on microscopic examination.

The only evidence in favor of cyst was transillumination. A diagnosis of nonpigmented, or slightly pigmented, sarcoma was made.

The following day under general anesthesia the eye was removed.

The following pathologic report was submitted by Dr. L. Christensen of the University of Oregon Medical School:

Gross description. The specimen is a modcrately hard eye measuring 26 mm. in the anteroposterior diameter by 23 mm. trans-

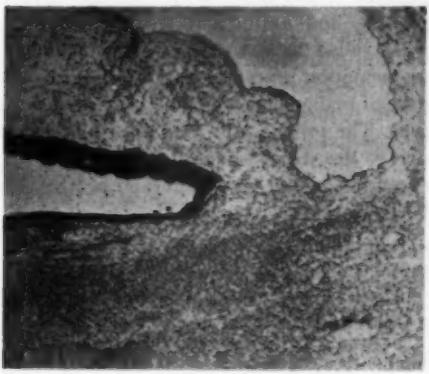

Fig. 1 (Veasey). Microphotograph of tumor, showing absence of pigment.

versely at the equator. The cornea shows moderate pericorneal injection and is partially opaque, making visualization of the anterior chamber, iris, and lens difficult. The sclera is clean and shows no evidence of tumefaction. The nerve is sectioned close to the globe, with the sheath intact and shows no evidence of neoplasia.

Transillumination of this specimen shows an area of opacity in the region of the ciliary body and pars plana measuring 14 mm. transversely by 10 mm. in the anteroposterior direction.

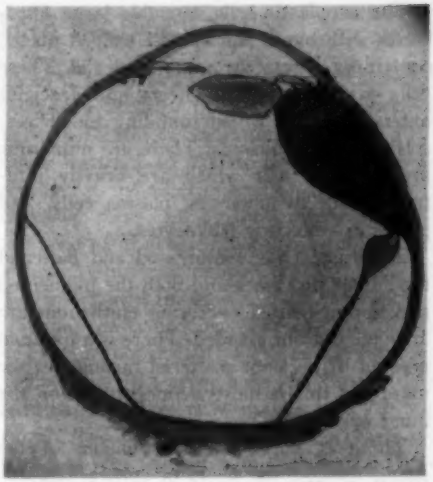

Fig. 2 (Veasey). Enlargement of slide, showing site of tumor.

The specimen was opened along the nasal side by vertical cut extending anteroposteriorly. On opening, a milky white fluid escaped which represented partially degenerated vitreous material. There was a grayish white mass arising from the choroid in the region of the ciliary body through the pars plana into the ora serrata, located approximately at the 6-o'clock position, measuring 4.5 mm. in elevation and 10 mm. at the base.

The cut surface showed mottled areas of pigmentation, blood sinusoids, and degeneration. The retina was detached parallel to the mass by a colloidal gel-like material. The macula was not visualized. The optic nerve showed nothing of note. The sclera at the base of the tumor showed no thinning or evidence of extraocular extension of this mass.

Histopathology. This is a well preserved, better than average, normal appearing, 72-year-old eye containing a large, flat tumor arising from the ciliary body and choroid composed of both neoplastic and inflammatory tissue showing areas of old hemorrhage and early necrosis.

The neoplastic cells resemble large fibroblasts with ovoid and spindle-shaped nuclei, containing coarse chromatin material. These cells are arranged in sheets and fasciculi extending from or surrounding blood vessels or blood sinusoids. There are numerous areas of necrosis which are heavily infiltrated with lymphocytes, plasma cells, and polymorphonuclear leukocytes.

The tumor has compressed and flattened the ciliary processes and both the pigmented and nonpigmented overlying epithelium are atrophic but not invaded. There is a minimal amount of pigment scattered throughout the mass and this is mostly concentrated on the inner surface.

There is no apparent extension of the tumor through the sclera or cornea, but several of the anterior perforating vessels and episcleral vessels are surrounded by cells resembling tumor cells as well as dense collections of inflammatory cells. Other than degenerative pannus the cornea shows nothing of note.

The anterior chamber is deep and free of cells and the chamber angle is open. However, in the region of the tumor there are numerous lymphocytes in the angle, as well as in the trabecular meshwork and Schlemm's canal, which is otherwise patent. There is a mild diffuse infiltration of the iris stroma by lymphocytes on the side of the tumor which is an apparent direct extension from the process in the ciliary body. There is an occasional subcapsular opacity in the lens.

Other than the tumor, the ciliary body shows little of note. In the choroid there are numerous focal collections of lymphocytes on the side of the mass and there are small Drusen bodies along Bruch's membrane. The retina is detached at the inferior border of the tumor by a large collection of colloid material, and that part overlying the mass is somewhat atrophic and invaded by inflammatory cells. The optic nerve shows nothing of note.

Comment

The translucency of this tumor is due to the lack of pigment material in it. However, pigment is not necessarily although usually present, and in the old terminology these were called leukosarcomas. The degree of pigmentation bears no relationship to the degree of malignancy which is based on the cell type. The prognosis in this case is not good due to the strong suggestion of extraocular extension along the anterior perforating vessels.

The patient remains in good health 18 months after enucleation.

This case is reported because it is probably a unique example of intraocular biopsy.

1569 Paulsen Building (8).

Microphotographs by Dr. Robert Fischer, University of Oregon.

NOTES, CASES, INSTRUMENTS

A NEW AND SIMPLIFIED ERISOPHAKE*

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When, in 1939, Dimitry[1] evolved a new sucking disk type of instrument for intracapsular cataract extraction he predicted that its adoption might play an important part in increasing the popularity of the procedure known as phakoerisis. Such proved to be the case. The Dimitry instrument had enormous advantages over the previously described instruments of Hulen[2] and Barraquer,[3] not only in simplicity of construction and use but also in lessening the hazardous complications of the procedure. Perhaps Dimitry's greatest contribution was his demonstration that the "only vacuum required to provoke a grasp in a sucking disk is that measured in the bore of the needle and the concavity of the cup."

Even the simple instrument of Dimitry, however, was too cumbersome for most surgeons. Its use required an uncomfortable and unaccustomed hand position both for its application to the lens capsule and for the subsequent manipulation of lens extraction. Attempts were made to modify the instrument to avoid this fault while still retaining the value of the basic principle, and a new interest in phakoerisis was awakened.

Thomas,[4] for example, attached a suction tip to a small, easily manipulated handle and this was in turn fastened by a short rubber tube to the syringe in which the vacuum was created by an assistant. This increased the ease of handling of the instrument at the expense of loss of direct control of the vacuum by the operator.

It remained for Bell[5] to devise the ultimate in simplicity in an erisophake when he fastened a small rubber contact glass sucking bulb to a Dimitry tip. This bulb, squeezed between forefinger and thumb, provides adequate vacuum to attach the sucking cup strongly to the anterior lens capsule and may be easily controlled by the surgeon without the need of assistance in the creation of the vacuum. Strangely enough the first sucking disk instrument for intracapsular cataract extraction, described by Stoewer[6] in 1902, utilized a rubber ball to create its vacuum.

Even the Bell erisophake has certain disadvantages. With only the support of the rubber bulb the needle may wobble when introduced into the anterior chamber and applied to the anterior surface of the lens.

After suction is applied and extraction of the lens is begun, the manipulation of the tip is controlled through the rubber bulb used as a handle. The slightest pressure on the rubber bulb will introduce air into the vacuum cup and its hold on the capsule will be lost.

The bulb and the needle together are so short that one does not have the accustomed "feel" of an instrument in the hand and precise control of rotation of the lens in the tumbling method of extraction is difficult and uncertain.

It occurred to me that, if the principle of the Bell erisophake could be incorporated in an instrument with a solid handle, rigidly fastened to the needle holding the suction cup, these disadvantages would be largely eliminated.

I have designed and used such an erisophake* (fig. 1) with satisfaction. A modified Dimitry suction cup fastened to a hollow needle is attached to a small rubber tube, closed at one end, whose stiffness and air content insure a good vacuum grasp of the anterior lens capsule (fig. 2) but whose outside diameter is small enough that it can be screwed into a hollow metal handle in such

* From the Division of Ophthalmology, University of California, and the Veterans Hospital, Fort Miley, San Francisco, California.

* Manufactured by V. Mueller, Chicago, Illinois.

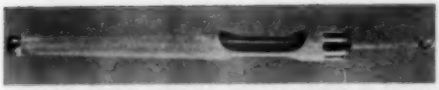

Fig. 1 (Harrington). Harrington erisophake, showing suction tip assembled with rubber bulb and handle. The suction tip can be disassembled from the handle. Total length of erisophake is 13 cm. (five inches); of the handle 10 cm. (four inches).

Fig. 2 (Harrington). Suction tip attached to lens capsule, showing degree of suction, lines of capsular traction, and forward displacement of line of previous zonular attachment.

a way that the needle and handle become a rigid unit and an easily manipulated instrument about the size of a 13-cm. (five-inch)-long pencil.

Control of the vacuum is maintained by forefinger against thumb pressure on the rubber tube through opening in the sides of the hollow metal handle. Once the vacuum cup has grasped the lens capsule the tube is released and further manipulation of the instrument in the extraction of the lens is through the rigid and easily controlled metal handle.

The effect is essentially that of a cross action forceps in that further pressure with the fingers need not be applied, thus allowing for much greater delicacy of touch in the manipulation of the lens.

With this instrument one has, at all times, complete control of both the vacuum and the lens movements. Should the vacuum cup slip off the lens it can easily be reapplied with a minimum of pressure and with vacuum control completely in the surgeon's hands. This reapplication may be made even in the case of a completely dislocated lens.

It has long been felt by many surgeons, and was so stated by Savage[7] in 1922, that the suction method of lens extraction would be the ideal method, if suitable, simple apparatus could be devised. This instrument is another step in that direction and will, I believe, still further popularize the procedure of phakoerisis.

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The photographs for Figures 1 and 2 were made at the Veterans Administration Hospital, Fort Miley.

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AN OPHTHALMOTROPE CONSTRUCTED ON A NEW PRINCIPLE*

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The ophthalmotrope, which is a mechanical visual aid used in teaching the function of the extraocular muscles, was first constructed by Ruete in 1857. Later models were made by Wundt in 1862, Donders in 1870, Browning in 1882, Aubert in 1857, Broditch in 1898, and Reeh, Stimmel and Heagan in 1947. Nearly all of these models consisted, in essence, of a freely movable globe suspended in some manner and equipped with cords so attached as to represent the lines of force of the extraocular muscles.

The demonstration principle on which most ophthalmotropes have been constructed is to answer the question, "What happens when a certain muscle acts on an eye which is fixing in a certain position?" This is, of course, a good question, but it happens to be exactly the reverse of the one which an ophthalmologist must ask himself when he is examining a patient.

As he looks at the patient, he sees only the globe and his attention is chiefly directed to the center of the pupil. Then, when the patient moves the eye in various directions of gaze, either on command or as the examiner moves an object of fixation, the examiner notes the movements which the eye does (or does not) make and asks himself, "What muscles have acted to produce these movements (or the failure of action of what muscles is responsible for the failure of the eye to move in certain directions)?"

The chief purpose of an ophthalmotrope is instructional. The ideal model would, therefore, permit the observer to think from rotation of the globe to the muscles producing the movement, rather than from the contraction of a muscle to the rotations it would produce.

The ideal model would permit the globe to be moved freely from one direction of gaze to another just as the human eye moves, while at the same time the student by means of some sort of indicating device could observe the relative quantity of action of representatives of the extraocular muscles. He could thus use the same order of logic as would be employed in examining a patient.

The model described in this communication is constructed to fulfill these principles.

Description of Ophthalmotrope

The ophthalmotrope which we have designed (figs. 1 and 2) is constructed on a scale of 6:1, trial and error having shown that this is the most practical minimum size for optimum demonstration purposes. Angle gamma (as well as angle kappa) was ignored in its construction and the left eye was arbitrarily chosen for representation.

It consist of the following parts: (1) a base, (2) a solid wooden sphere, (3) a suspensory apparatus for the sphere, (4) an indicator panel, (5) a base for the indicator panel fitted with a horizontal wooden post—the posterior support of the globe, (6) cords, pulleys, and weights, and (7) pointers (indicators).

A description of the parts follows, the letters corresponding to the letters indicating the various parts of the model in Figures 1 and 2.

* From the Division of Graduate Medicine, Department of Ophthalmology, The Tulane University of Louisiana. Designed and constructed under a grant by the Gulf States Eye Surgery Foundation.

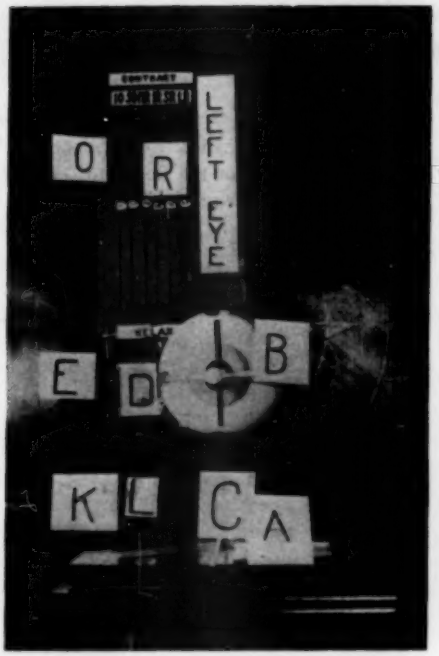

Fig. 1 (Mims, Martin, and Clark). The front view of the ophthalmotrope. The lettered cards are placed on or attached to the appropriate structure as described in the text.

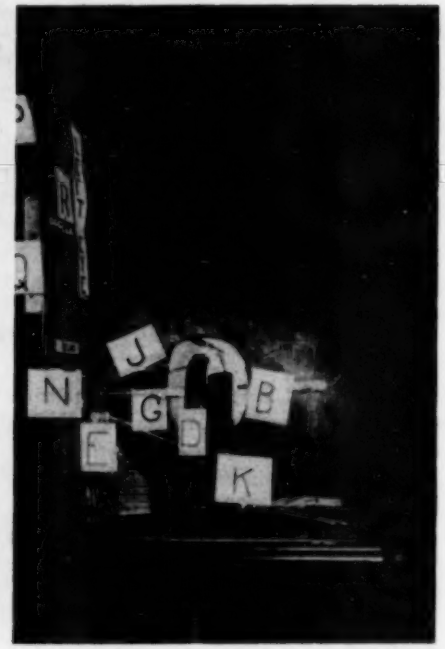

Fig. 2 (Mims, Martin, and Clark). The side view of the ophthalmotrope.

The base of the model (A) consists of a 1 by 12-inch board 18 inches long, with a white line painted down the center lengthwise. This line represents the anterior-posterior axis of the eye in the primary position.

The globe (B) is a solid wooden sphere, six inches in diameter. A wooden handle is securely fixed into it at the pupillary center and projects in the line of gaze.

The globe is suspended inferiorly on a yokelike support (C) located slightly in front of the equator and capped on each supporting contact on each side by a chromimum-plated chair leg glider. The geometric center of the globe is 7.5 inches above the base of the model. This inferior support serves the purpose of the suspensory ligament of Lockwood.

The globe rests medially on another support (D) of similar construction to the inferior support and with two points of contact with the globe, one above and one below the cord which represents the medial rectus muscle. The medial support is necessary because of the constant pull of cords representing the oblique muscles, which otherwise draw the entire globe off its inferior and posterior supports. The anatomic counterpart of the medial support is the medial wall of the orbit and parts of the orbital fascia which also support the globe medially.

Behind the globe is the base for the indicator panel (E) cut from 1 by 6 inch stock and measuring 12 inches long by 4.75 inches high. It is set on a vertical wooden support with its face perpendicular to the base of the model, and it is so placed that it forms an angle of 65 degrees with the white line running lengthwise down the center of the base of the model.

From the center of the base of the indicator panel, 7.5 inches above the base of the model, there projects a horizontal post (G) turned out on a lathe to receive on its end a ring of ball bearings two inches in diameter. The posterior aspect of the globe rests against the ring of ball bearings and is protected from abrasions by a sheet of copper spun over its posterior surface.

The post represents the central longitudinal axis of the muscle cone, which forms an angle of 25 degrees with the anterior-posterior axis of the head. It is so placed as to form this angle with the white line down the center of the base of the model, and it also performs the supporting function of the retro-orbital tissues.

Attached to the globe by metal pins, in positions corresponding to the anatomic centers of the insertions of the muscles which they represent, are short brass straps 3.5 by 0.625 inches, to the ends of which rings have been fitted.

Attached to these rings are the cords which represent the rectus muscles (J). All of these cords run backward along the supporting post against which the globe rests posteriorly to pass through openings in the base of the indicator panel. These openings represent the points of origin of these muscles as well as the points of origin of their lines of force.

An upright piece of wood (K) located in front of the medial support of the globe supports a pulley located 9.5 inches above the base of the model. This pulley represents the trochlea of the superior oblique muscle. Another pulley supported by a short brass rod (L) located 3.5 inches above the base of the model represents the point of origin of the inferior oblique muscle.

The principle of the trochlea is used for the cords representing both the oblique muscles, and their cords, like the cords representing the recti, run backward and through openings in the base of the indicator panel. The openings for the oblique muscles are not located to represent any anatomic counterpart. The site of origin of their lines of force is at pulleys located on the medial aspect of the globe.

As the cords pass through the openings in the base of the indicator panel, they run over 0.5-inch brass pulleys set into the back of the base. They then turn slightly upward to run over a second set of pulleys fitted on a brass rod (N), which serves as an axle for this set. The rod is attached to the base of the indicator panel by a bar 2.5 inches long on the left and five-eighths inches long on the right. By this device the angle at which the base of the indicator panel is set is overcome and the cords are brought into a parallel relationship with the indicator panel itself.

The indicator panel (O) is constructed of a piece of wall board eight inches wide and 17 inches long. It is perpendicular to the line of vision of the observer and to the base of the model, being set at an angle of 25 degrees with the panel base. The panel is brown in the upper portion and green in the lower. Six vertical slots are cut into it.

The cords which represent the various muscles, after being redirected by passing over the second set of pulleys, as just described, pass upward vertically on a third set of pulleys behind the top of the indicator panel (P). The cords then run downward to be inserted into the tops of lead weights (Q).

The weights are cast from lead and are three-eighths inch thick, one inch wide, and 6.5 to 8 inches long. Their weight was varied by making them different lengths, the cords representing the oblique muscles being attached to the lightest weights and the vertically-acting recti being attached to the heaviest weights. Trial and error proved the necessity for this variation in the weights.

The cords are inserted into holes bored vertically into the upper ends of the weights for 0.5 inch. At this point they emerge into slightly larger holes bored through the weights at right angles to the vertical holes. The end of each cord is tied in a simple knot which pulls back into the through-and-

through hole but which cannot work up through the smaller vertical hole. The weight is thus suspended on the end of the cord without projecting cord or knot.

The indicators or pointers (R), which are marked with the initials of the various muscles, are constructed of strap metal in two parts. One part is bent around the cord snugly but loosely enough to allow it to slide up and down for adjustment. The other piece, which is shaped like an arrowhead, is bradded to the first piece. It is long enough to overlap both edges of the slot in the indicator panel in which it slides up and down, but it is not long enough to interfere with the markers on each side of it.

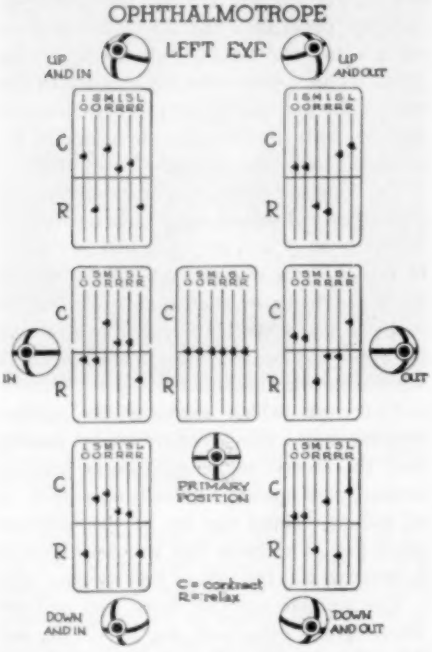

Fig. 3 (Mims, Martin, and Clark). Each of the panels in this diagram represents the indicator panel of the ophthalmotrope when the globe is rotated in the manner indicated. The quantitative contribution of each muscle in producing a change in the direction of gaze may be noted by comparing the amount of change in position of the pointers between the first and second directions of gaze considered.

Concepts of operation

The ophthalmotrope is simple to operate. When the globe is rotated by manipulating the handle set into it, the cords which represent the muscles concerned in the particular movement will shorten or lengthen, just as when the eye moves the appropriate muscles relax and contract. As a cord shortens (contracts), its corresponding pointer will go up on the indicator panel. As a cord lengthens (relaxes), its corresponding pointer will go down (fig. 3).

The ophthalmotrope is constructed on the following assumptions, which are accurate enough (though admittedly not entirely precise) to serve as useful working concepts:

1. The single cords represent the longitudinal anatomic centers of the extraocular muscles, regardless of the direction of gaze. They thus represent the lines of force of the muscles, although not the vectors of forces exerted by them.

2. The globe is freely movable and turns about the center of rotation, which for all practical purposes is the geometric center of the globe.

3. When the tone of all of the muscles balances, there is no movement of the globe. If one or more muscles change their tone in relation to the other muscles, movement of the globe will result.

4. When a muscle increases in tone, it shortens or contracts unless it is opposed by an opposite and equal force created by its antagonists. When a muscle decreases in tone, it lengthens or relaxes unless opposing forces are increased by an equal amount.

5. The amount of shortening or lengthening which a muscle undergoes as the eye moves from one position to another is directly proportional to the rotation of the globe which it is causing by its action.

When the positions of the pointers on the indicator panel of the ophthalmotrope (fig. 3) are compared during (or before and after) any given change in the direction of gaze of the globe, the observer can instantly

see: (1) Which muscles contract; (2) which muscles relax; (3) how much the muscles contract and relax in relation to each other.

Specific demonstrations

The ophthalmotrope described lends itself equally well to class demonstration and individual study. It also illustrates three specific things:

1. The actions of the muscles in the six cardinal directions of gaze. For this demonstration to be of value the pseudotorsions of the globe in tertiary positions of gaze must be remembered, since the greater size of the model (in proportion to the size of the eye) magnifies these apparent torsions, which occur according to Donder's and Listing's laws. Four of the six cardinal directions of gaze are tertiary positions. Study of the model will make clear that the lateral and medial recti must be in good working order before the elevators can be properly evaluated in the fields of their greatest action as elevators and depressors.

2. The action from the primary position of a single pair of antagonists. For this demonstration the globe is rotated as necessary while the pointers are watched. All pointers, except those indicating for the two cords whose action is to be studied, are maintained on, or as near as possible to, the zero line for the primary position.

3. The principle of the Duane diagram. For this demonstration the globe is turned either inward or outward without vertical movement. It is then alternately elevated and depressed as it is brought toward the opposite side. It is necessary in this demonstration, as in the demonstration of the action of the muscles in the six cardinal directions of gaze, to bear in mind the pseudotorsions in the tertiary fields of gaze. It will be observed that the superior and inferior recti show the greatest excursions on elevation and depression of the line of gaze laterally, while the superior and inferior obliques are the most active medially.

Summary

A new ophthalmotrope has been described which permits the observer to correlate a movement of the globe with the muscles producing the movement. This is the more natural approach, as it is the one which an ophthalmologist examining a patient must use. This model thus differs from other models in which the approach is usually the exact reverse. An important difference is that the model is equipped with an indicator panel which permits the observer to see at a glance not only what muscles take part in any given movement of the globe but also the quantitative contribution of each muscle to that movement.

This ophthalmotrope is useful for class demonstrations and individual study, and also permits the demonstration of (1) the action of the extraocular muscles in the six cardinal directions of gaze, (2) the action from the primary position of a single pair of antagonists, and (3) the principle of the Duane diagram.

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E-3—LACHESINE

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In 1949, I reported[1] on the clinical use of mydriatics. Among the three mydriatics omitted at the time because they were unobtainable was E-3.

Recently a sample of this product was sent to me for clinical study.*

Chemically E-3 is known as benzilyloxyethyldimethylethylammonium chloride. It is a white powder that dissolves readily in water and can be easily sterilized. It was developed in the Dyson Perrins Laboratory of Oxford, England, and has been accepted by the director of research and development of the Ministry of Supplies of England under the name of Lachesine.[2]

The chemistry and laboratory studies, as well as the clinical findings were reported by Ing,[2] Riddle,[3] and Ida Mann.[4]

Lachesine, like Dibutalin discussed in my previous paper,[1] is a surface-active agent.

Over 100 of my cases were checked with a one-percent solution of Lachesine. The dose was one drop of this solution at the upper limbus. There never was any pain or corneal edema.

Included in my cases were a congenital and senile cataract operation, several cases of uveitis, and seven infants† ranging in age from 4 to 19 months. In these latter cases, no particular instruction was given as to how this mydriatic was to be administered, yet no case gave any untoward symptoms. In 94 patients from the ages of 2 to 60 years, Lachesine was used for either fundus examination or refraction.

Lachesine was well tolerated when it was substituted for atropine in the presence of an allergy to this drug. There were nine children and one adult, aged 53 years, in whom atropine allergy was clearly demonstrated.

Usually one drop, sometimes two, and, on three occasions only, three drops were necessary. Ordinarily, it took 30 minutes for the pupil to dilate; however, in some cases it required up to an hour or an hour and a half, during which time a second drop was necessary.

When the pupil became maximally dilated, it took from seven hours to one day, rarely two days, for the pupil to contract to normal.

CLINICAL OBSERVATIONS

An interesting case was that of a Negress, aged 32 years, who obtained one instillation of Lachesine. The pupil dilated fully in a half hour, with cycloplegia. The pupil remained fully dilated for five days.

On several occasions two-percent pilocarpine was used after Lachesine to contract the pupil. In one patient, it took seven instillations of five drops each of pilocarpine over a period of three and a half hours, to bring the pupil to normal. This patient was aged 32 years and had a brown iris. She had originally obtained two drops of Lachesine over a period of one hour.

In another patient, aged 28 years, with a conical cornea and a blue iris, only three drops of two-percent pilocarpine were necessary to bring the pupil to normal in two hours. This patient had received two drops of Lachesine.

Ocular tension was taken on 10 patients before and after instillation of E-3. There were no changes in pressure.

A cycloplegic test was done on some of the patients, as was done in the previously reported cases.[1] Of 30 patients selected for this test, 8 had no cycloplegia whatever, in 10 the cycloplegia was questionable, 12 showed definite cycloplegia.

Arranged in the order of their potency—atropine and scopolamine would lead the list of mydriatics, followed by Eumydrin, Duboisine, Lachesine, and, lastly, homatropine. The last two drugs are the safest.

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* I am indebted to the British Chemical and Biological, Ltd., for this product.

† The infants and children were from St. Christopher's Hospital.

A distinct advantage in Lachesine is that it is dispensed in powder form. Thus a fresh solution of this surface-active agent may be prepared in as small a quantity as deemed desirable.

37 South 20th Street (3).

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AN UNDER-DRAPE VENTILATOR FOR CATARACT SURGERY*

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One prominent complaint of patients having cataract extraction under local anesthesia has been the feeling of suffocation and heat as they breathe under the drapes. This has contributed a good deal to restlessness and consequent straining and even squeezing of the eyeball by the patient during surgery.

To eliminate this hazard, and to add to the comfort of the patient under local anesthesia for intraocular surgery, it was felt that some attempt should be made to provide a cooler, more comfortable atmosphere beneath the drapes without encroaching on the surgeon's field. To accomplish this a suction tubing is placed over the patient's lower jaw, in close proximity to the mouth, to suck away the warm air that accumulates beneath the drapes (figs. 1 and 2).

The response by patients has been remarkable, particularly so in the case of those who have had the second eye operated upon using this apparatus, after having had the first eye done some months prior to the use of suction. No

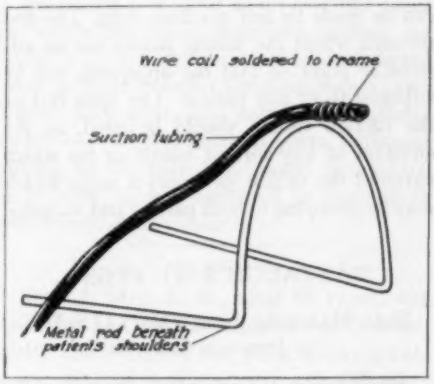

Fig. 1 (Farquharson). Suction tubing supported by frame.

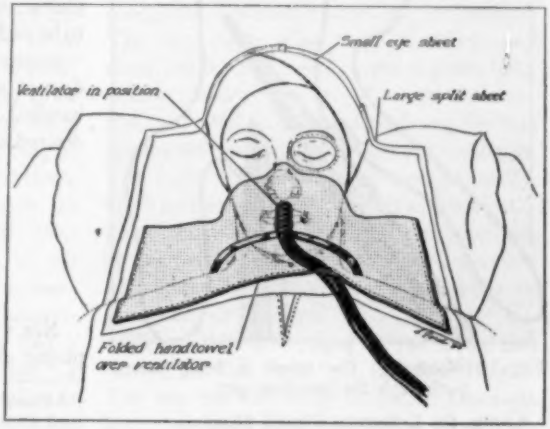

Fig. 2 (Farquharson). Showing relation of suction tubing and frame to patient's face beneath the drapes.

* From the Departments of Anesthesiology and Ophthalmology of the University of California Hospital.

longer is there the feeling of suffocation due to the hot humid atmosphere beneath the drapes. These patients now are quieter, more relaxed, and comfortable. The results are, of course, of the utmost importance to the ophthalmic surgeon in intraocular surgery. The apparatus adds to the comfort of any patient who is undergoing surgery under local anesthesia, necessitating the use of drapes over the face.

The apparatus is easy and inexpensive and can be made by any machine shop. The coil through which the tubing passes has an adjustable point so that the apparatus can be adjusted to fit any patient. The open end of the suction tubing should be used, as the addition of any sort of nozzle or tip which narrows the orifice, produces a noise which may be annoying to both patient and surgeon.

TANTALUM FOIL PEGS*

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About two years ago, after observing how little tissue reaction there was to tantalum, it was decided to try it as pegs in plastic surgery about the eyelids. Tantalum foil was folded into four or six thicknesses and sutures were found to pass easily through either thickness when the foil was held with a forceps (fig. 1). It was found not to buckle when the sutures were tied and there was no tissue reaction.

Fig. 1 (Maxwell). The suture is being passed through the tantalum peg.

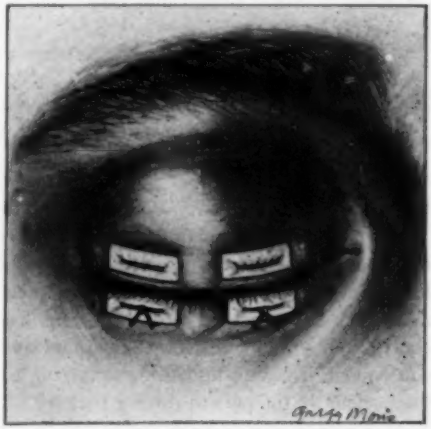

Fig. 2 (Maxwell). Tantalum pegs used in tarsorrhaphy.

Since the initial trial, it has been used extensively and found to be more satisfactory than any other substance in tarsorrhaphy (fig. 2), Blaskovicz's ptosis operation, lid repair, reconstruction of the orbit, and other plastic procedures requiring tension sutures to be tied over pegs. It has several advantages —among them: it is nonirritating, secretions do not adhere to the material, it is easily handled, and may be quickly trimmed to any desired size or shape.

* From the Letterman General Hospital.

ONE-SIDED EPIPHORA*

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Not so rarely a patient is seen who complains of one-sided epiphora. After exclu-

* From the Department of Ophthalmology, Stanford University Medical School.

sion of an irritating foreign body, distichiasis, conjunctivitis, or superficial keratitis, the tear passage is examined. In many cases, however, it can be washed through easily, toward the nose, and the watering of the eye is not explained by a blockage of the tear duct or the tear sac. The nose and the sinuses may be without any pathologic finding to explain the disturbance, and X-ray examination of the tear passage—after lipiodine injection—may show no anomalous configuration.

In practice, a number of such cases of one-sided epiphora will then receive repeated irrigations of the sac or the patients will be treated for allergy. One of our patients reported that tincture of belladonna was prescribed, 40 drops to be taken by mouth three times daily. When this medication had no effect, removal of the tear gland was suggested.

When the lower tear point is examined in these cases, it seems in good position at the first glance, but at closer inspection the point may be seen everted to a minute degree, when compared with the tear point of the other side where it appears in closer apposition to the conjunctiva bulbi.

Stallard[1] says, that epiphora may be "due to a small, spastically closed, lower punctum," in which case he recommends the "three-snip operation." I do not think that the tonus of the sphincter, or at least not the tonus of the sphincter alone, is the cause of the tearing, and for the following reason:

Occasionally cutting of the sphincter alone gives relief, but the cut has then to be made toward the conjunctiva tarsi, while cutting of the sphincter in any direction should relieve the spasm of an overactive ring muscle. In most cases, cutting of the sphincter, even toward the tarsus, is not sufficient, as the healing conjunctiva again blocks the communication of the tear duct with the conjunctival lacrimal lake. I then have had a good result with Hoffmann's excision,[2] a procedure which corresponds to Stallard's three-snip operation.

Technique

The lower canaliculus is slit two to three mm. with a canalicular knife (Weber), a right-angled incision with scissors is made toward the conjunctiva at the site of the punctum, and the so-formed small triangle of the posterior canalicular wall is excised. The wound is controlled for several days so that the communication of the canaliculus with the conjunctival sac is kept open.

Following is a short history of five cases in which the above-described method relieved a one-sided epiphora which had caused some patients to suffer for more than a year. These cases were seen among our patients in the last two and one-half years. Although slitting of the tear duct should be avoided if possible, it was indicated in these cases and benefited the patients.

Case reports

Case 1. Mrs. E. R., aged 59 years, was seen first for left-sided epiphora in October, 1946. The left lower tear point was very narrow and could be dilated only with difficulty; the left tear passage washed through easily toward the nose. Injection of lipiodol in the tear sac showed normal configuration of the canal and sac.

Since the epiphora continued with slight fluctuations, on January 23, 1947, the lower tear point was split toward the conjunctiva. The next day tearing stopped entirely and there has been no more epiphora since (November, 1949).

Case 2. Mr. L. B., aged 66 years, had had tearing in the right eye for eight months. The right tear sac washed through easily. On October 30, 1948, the right lower tear point was slit. Since tearing continued, on November 9, 1948, a Hoffmann's excision was done. There have been no more complaints about tearing.

Case 3. Mr. I. S., aged 71 years, had had tearing of the right eye for three weeks. The tear sac was easily irrigated. The right lower tear point appeared farther away from

the conjunctiva bulbi than the left tear point. On May 29, 1948, slitting of right lower tear point was followed by Hoffmann's excision. There has been no tearing since.

Case 4. Mrs. M. F. V., aged 72 years, had had tearing of left eye for one year. On June 28, 1948, Hoffmann's excision was done with good results for 10 days, after which there was no tearing but the eye felt wet. The triangular opening had narrowed markedly, so the excision was slightly enlarged. Since then there had been no more tearing, "not even in strong wind."

Case 5. Miss M. K., aged 38 years, had had right epiphora for one year, treated by an oculist with tincture of belladonna. Later removal of the right tear gland was recommended. She was sent to an ear and nose specialist who gave her tablets for an allergic condition.

When she was seen on October 8, 1949, the right tear sac washed through easily. The right lower point turned slightly outward as compared to the left point. The right lower tear point was slit toward the conjunctiva. The patient had relief for only two days, although the incision was opened again. Therefore, on October 8, 1949, a Hoffmann's excision was done with the result that tearing has been relieved since.

Summary

In one-sided epiphora without an apparent cause, a minute outward position of the lower tear point, compared to the position of the point in the other eye, should be looked for and, if present, a Hoffmann's excision of the posterior wall of the lower canaliculus may relieve the epiphora.

350 Post Street (8).

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FLUORESCEIN PAPER*

A SIMPLE MEANS OF INSURING THE USE OF STERILE FLUORESCEIN

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The susceptibility of fluorescein solution to bacterial contamination, particularly with Pseudomonas aeruginosa, prompted an effort to develop an equally stable preparation of the drug whose sterility could be relied upon. Even the use of preservatives, such as quarternary ammonium chloride (1:8,000) and sterilization by autoclave, fail to eliminate the danger of contamination and solutions must be replaced frequently to be considered safe. Unfortunately it is common office practice to use a dropper bottle of fluorescein indefinitely and to discard it only after an infection has been traced to it.

In view of the disastrous nature of the pyocyaneus hypopyon ulcer which may follow the use of a contaminated fluorescein solution, a trial with fluorescein paper is recommended on the basis of the following experience at the University of California Eye Clinic:

For the past two years fluorescein-impregnated paper has been substituted satisfactorily for fluorescein solution in this clinic. It has proved to be easy to make, easy to keep sterile, and thoroughly stable (fig. 1—A, B, and C).

METHOD OF PREPARATION

Bibulous filter paper (Braun-Knecht-Heimann #28510, San Francisco) was found to be the best paper available for the preparation of fluorescein paper but any fine-grade filter paper can be used. One-half inch of

* From the Division of Ophthalmology, Francis I. Proctor Laboratory for Research in Ophthalmology, University of California Medical School.

one edge of a strip of filter paper 10 by 2 inches long is painted with 20-percent aqueous fluorescein solution (fig. 1—A). When dry it is cut into small strips 2 by 0.25 inches (fig. 1—B). The strips are then placed in a container with a screw cap (fig. 1—C) and sterilized.

Sterilization may be accomplished in a dry-heat sterilizer (45 minutes at 100°C.) or in

Fig. 1 (Kimura). (A) Strip of fluorescein-impregnated paper. (B) Filter paper cut into small strips. (C) Papers placed in screw-capped container for autoclaving.

an autoclave (20 minutes at 105°C.). If the the autoclave method is used, the paper container must be steam-tight. Oversterilization will parch the fluorescein and the paper.

Method of use

Fluorescein paper may be used dry if the eye is tearing, the tears serving to dissolve the fluorescein. In dry or nontearing eyes, a drop of water or saline is first placed on the paper to dissolve the fluorescein and the tip of the paper is then touched to the conjunctiva. After instillation the eye is not irrigated.

Advantages of fluorescein paper

In addition to the obvious value of insuring the use of sterile fluorescein in eyes with corneal abrasions, fluorescein paper offers a number of lesser advantages:

1. Irrigation is not necessary after instillation. This is often a definite advantage in cases of external disease from which cultures are to be taken. Cultures from eyes which have been irrigated are often unsatisfactory.

2. Fluorescein in paper form is convenient for carrying in the medical bag.

3. The amount of fluorescein is so small that there is less likelihood of staining the patient's lid margins and clothing or the physician's fingers.

The Medical Center (22).

RECURRENT UVEITIS*

A new case of a complex syndrome

B. Adamantiadis, M.D.
Athens, Greece

Recently I had the opportunity to examine with Prof. N. Lorandos a new case of the syndrome, first described by me in 1930, the main characteristics of which are: (1) A recurrent iritis with hypopyon, (2) aphthae in the mouth, (3) ulcerations of the genitals, (4) thrombophlebitis of the fundus or the legs.

Very often this syndrome is accompanied by arthralgias, edema of the joints, erythema nodules, nervous disturbances, and so forth. Recurrence is the main characteristic of all these symptoms.

One may distinguish three periods of the syndrome in reviewing the literature:

1. *The initial or ophthalmic period.* During that period one chief element is described: the recurrent iritis with hypopyon. I think that J. Janin, in 1772, first described the condition under the name "periodic hypopyon." Until the beginning of the 20th century no further mention of the disease is made. In 1898, Neuschüler and, after him, Reis (1906) and Blüthe (1908), discussed the disease. German-speaking scientists added further descriptions (Gilbert, Köppe, von Hippel, Weve, Urbaneck). Gilbert, who considered the gravity of the condition, gave it the name "ophthalmia lenta."

2. *The dermatologic period.* Some authors describe the dermatologic signs of the syndrome not knowing its relation to the

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* Presented before the Hellenic Ophthalmological Society, February, 1949. I am greatly indebted to Prof. N. Lorandos for his medical assistance and his advice.

recurrent iritis with hypopyon. Lipschütz (1912) described the "ulcus acutum vulvae"; Chauffard, Brodin, and Wolf (1923), described the "aphthosa stomatitis und vulvitis" with nervous disturbances; Carol and Ruys (1928) described "aphthae" of the mouth with "ulcus acutum vulvae," and so forth.

3. *The period of a complex syndrome.* In 1930, I first described the combination of "recurrent iritis with hypopyon," aphthae of the mouth, and ulcerations of the genitals. Since then many authors (Dascalopoulos, 1932; Behçet, 1937, Weekers, 1938, Cavara, 1940, Franceschetti, 1942, and others) have described the syndrome. More particularly the Turkish dermatologist, Behçet, has insisted on the triple symptomatology of the syndrome by publishing cases in several European periodicals, thus making the syndrome known as "Behçet's syndrome."

Studying my own records, as well as of other authors, in 1945 I realized that thrombophlebitis was an equally frequent element of the syndrome, whether it was localized in the veins of the eye fundus or of the legs, and that it presented the same recurrence characteristics.

The four symptoms just described do not always have the same importance. When the syndrome appears, an isolated symptom may be present, or different combinations of symptoms may appear at indefinite intervals.

Recently the syndrome has been increasingly studied by ophthalmologists and dermatologists. Some dermatologists have recorded cases without the ocular symptoms (Helen Curth's recent paper concerning the case of a woman with only ulcerations of the genitals and stomatitis).

This tempts me to point out that, from a dermatologic standpoint, enough time must elapse before one can be convinced that those mono- or bisymptomatic cases are not later followed by an ocular localization. For, experience has shown me that one of the cardinal symptoms often precedes the other ones by 5 or 10 years, so that the case cannot always be thoroughly followed by the physician who first described it.

In the cases recorded to the present, the relapsing attacks of the eyes first appeared as an iritis with hypopyon. After a while, however, the disease spreads to the other parts of the uvea as well as to the nervous sheet.

Recently I saw a patient who, long ago presented aphthous stomatitis and ulcerations of the genitals and who, only a year ago, began to have recurrent ocular symptoms. However, the initial localization was not in the iris but in the choroid. The patient showed abundant exudates of the vitreous alternatively in the one or the other eye, which were quickly absorbed in one or two weeks. Eventually, in three or four months, he began to present recurrent iritis.

Case report

History. E. P., a man, aged 38 years, was born in Crete. He consulted Prof. N. Lorandos on May 6, 1948, complaining of recurrent ulcerations of the mouth and the genitals, which were lately accompanied by ocular dimness. Professor Lorandos, being aware of my previous papers on the subject, immediately diagnosed the syndrome and sent the patient to me for an ocular examination. Since then the patient has been followed by both of us separately according to the dominance of his current symptoms.

The patient recorded that, since 1938, he had had ulcerations of the genitals as well as aphthae in the mouth. In 1940, when he was recruited, he presented ulcerations on the legs. In 1941, he submitted to a treatment for an acute gingivitis. In 1945, he had edema of the left knee and arthralgia. He had been treated for rheumatism. The aphthae of the mouth as well as the ulcerations of the genitals have often relapsed.

In March, 1946, he first felt vision in the left eye diminishing. In October of the same year, he presented a central scotoma and at the same time a relapse of the stomatitis and of the edema of the joints. All these symptoms improved within 8 or 10 days.

In November of the same year a new attack of stomatitis occurred. An amygdalectomy was performed because the patient presented pyogenic tonsils. In the meantime, the patient for the first time remarked a thrombophlebitis of the thigh, which soon improved.

New ocular attacks in January, 1947, were diagnosed as retinitis in Athens. All laboratory studies were then negative. The patient, at the same time,

presented symptoms of the joints which improved within two weeks.

In January, 1948, new attacks occurred in the left eye. An oculist confirmed the presence of exudates in the vitreous. Complete recovery occurred within 10 days. In April, 1948, he suffered attacks in both eyes. The patient related that he saw moving specks and that the images were perceived as if through a wet glass. He quickly recovered.

A new attack in the left eye took place two days before the patient consulted me on June 15, 1948.

At the examination, vision was: O.D., 0.6; O.S., 0.1. Tension was normal. Reactions of the pupil were normal. The anterior part of the globe was quite normal, neither ciliary injection nor any biomicroscopic lesion was perceptible.

At the ophthalmoscopic examination I observed slight, dustlike floating bodies on the whole vitreous. The optic disc appeared rosy with a little halo extending along the vessels. The visual field was normal with a little enlargement of the spot of Mariotte.

In the left eye the floating bodies of the vitreous were more abundant and bigger than in the right eye, and they did not allow a clear aspect of the fundus. A big mass resembling a spider occupied the space behind the crystalline lens. The optic disc appeared clearly.

In addition to the eye findings, the patient presented ulcerations in the mouth and the genitals.

The floating bodies were gradually absorbed, but at the beginning of July the patient had a thrombophlebitis of the thigh. By the end of July he had a new attack in both eyes. The right one presented a number of dustlike exudates; the fundus of the left eye was nearly invisible because of abundant exudates. The patient also told me that recently he had had an iritis successively in both eyes.

I examined him again on August 12, 1948, while both eyes were quiet. Vision was: O.D., 0.6; O.S., 0.25. The right eye presented a lot of spots of pigment on the anterior crystalloid; the left eye had no trace of a recent iritis. The fundus of both eyes, mainly that of the left, presented minute white spots of choroiditis around the macula.

By the end of December, 1948, the patient had a new attack of iritis in both eyes, and at the same time a thrombophlebitis of the thigh.

Laboratory examinations were essentially negative. There was a slight leukocytosis (11,000); prothrombin time, 16 to 53, depending on the dilution; red cells, sedimentary, 37.5 percent.

It is curious to note that this patient, too, presented a cutaneous redness with a pustule formation at the spot of every injection, a finding that I had already observed in another patient and which Katzenbogen, too, mentioned in a case he had observed.

Comment

The study of my six cases and those recorded by several authors enables me to state that there is a great irregularity as to the time when the different elements appear. Often it is the iritis which first appears, sometimes the thrombophlebitis, and so forth, the other symptoms following after a time varying from some months to 5 or 10 years.

The etiology, according to researches of many authors, remains obscure and unknown. The examination of enucleated eyes (Blüthe, Blöbner, Gilbert, Weve, Cavara) showed the presence of simple inflammatory lesions, which some authors (Weekers) attributed to allergy.

One might attribute to allergy the arthralgia, the iritis, and some cutaneous lesions, but this does not explain either the aphthae of the mouth, or the ulcerations of the genitals, or the meningoencephalitis, and so forth.

Probably it is caused by a chronic virus (Lorandos) or a staphylococcus (Cavara and others) infection. Periodically allergic, as well as inflammatory attacks (thrombophlebitis), occur and it is then that the aphthae are observed.

The prognosis is very serious because the illness, in most cases, ends with a blindness. As a matter of fact, Urbanek urged a blood transfusion of 400 to 450 gm. at once, with an alkaline diet. This helped to stop the relapses in two of his patients. Blöbner, too, had a cure of one year in one patient. Knapp reported an amelioration of the iritis with cibazol and of the aphthae with nicotinamid. Dennel observed an amelioration with ascorbic acid. The majority of authors, however, consider the illness as incurable. I had no cure of the illness in any of my six cases.

Recently in a case recorded by Mitavuli, I stated that she cured ophthalmia lenta by using transplantation of placenta. I confess that the records of the illness seemed to me not quite precise. At any rate one has nothing to lose by testing the method.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

394th Meeting

March 15, 1950

DR. BENJAMIN SACHS, *presiding*

ACUTE CONGESTIVE GLAUCOMA

DR. HARRY E. JUDSON, of Pittsfield, Massachusetts, reported the case of a 21-year-old man who experienced an attack of acute glaucoma in his left eye in May, 1948. Tension was 48 mm. Hg (Schiøtz). This attack was controlled within 36 hours by the use of miotics, and there was no demonstrable loss of visual acuity or visual field.

In March, 1949, the patient was struck forcefully in the same eye by the lever of a machine he was operating. Examination disclosed a marked edema at the temporal margin of the optic disc and throughout the macular region, with the appearance of a flat separation of the retina inclusive of these areas. No retinal tears or hemorrhages could be seen. The vision was reduced to 5/200. Hypotony was marked.

After two weeks of absolute bedrest, pinhole glasses, and atropinization, there was only slight improvement. Three months of limited activity at home brought the visual acuity up to 20/200, but the appearance of the fundus was unchanged. The tension remained at about 17 mm. Hg (Schiøtz).

One night during July, 1949, the patient again experienced severe pain in the injured eye. Examination revealed a recurrence of the congestive glaucoma. The tension was 59 mm. Hg (Schiøtz). This time the tension did not respond to miotics, and after 36 hours an iridencleisis was performed. Directly following surgery the tension returned to normal and has remained there since.

Within 24 hours after the iridencleisis was done, a clear view of the fundus could be had. All signs of the edema and the retinal detachment had disappeared. Visual acuity returned to 20/20 and the visual fields returned to normal. This has now persisted for 10 months, and the patient has returned to his usual form of employment.

Discussion. Dr. F. H. Verhoeff: I never saw a case of this kind nor heard of one, and it seems to me all such cases ought to be reported. I don't think the members of this society have been reporting as they should. Dr. Judson sets a good example to other members of the society. The case was referred to me in consultation, and I remember that I expressed the opinion that the chances were good that the retina would go back, but I must say I never thought the patient would get 20/20 vision if it did go back. I think it is a most amazing case.

Dr. Benjamin Sachs: Was it a true separation or edema of the retina?

Dr. H. E. Judson: At first we thought, of course, that it was a massive edema but after its persistence, in increasing degree, in spite of absolute bedrest for several days, we concluded that it was really a separation. Dr. Schepens and Dr. Verhoeff agreed that it was a separation.

Dr. Benjamin Sachs: Dr. Schepens, would you like to discuss this case?

Dr. C. L. Schepens: I think that it mainly emphasizes what hypotony can do to the eyeball.

In a number of cases of retinal detachment that have been operated, we have noticed the edema, and when I saw this case I hoped (because I couldn't ascribe it to any other cause) that hyoptony was the cause of the trouble. There was some edema of the macula, but also this queer elevation around the macular area which I thought was due to detachment. I have never seen a detachment

of the posterior quadrant so extensive from hypotony alone. I would say that this is the most important feature of this case, and we ought to keep it in mind.

I have noted recently two cases sent to the Retina Service from the Eye Clinic here. Both had had a cataract extraction, following which they had a choroidal detachment, but also some degree of very flat retinal detachment. This, again, I think, is solely due to their hypotony. I think that when we don't find a hole, we know that there is good reason for believing that hypotony has been present before detachment, either after a blow or after a cataract extraction, or maybe some other procedure.

Dr. Benjamin Sachs: How low was the tension during hypotony? Do you remember, Dr. Judson?

Dr. H. E. Judson: I didn't take it too often because it was too low. It was very soft to the fingers, but I do remember offhand as recording it at around 15 to 17 mm. Hg (Schiøtz).

Dr. Benjamin Sachs: Why didn't the retina redetach itself after you operated for the glaucoma and got hypotony?

Dr. H. E. Judson: I don't believe we had the secondary hypotony, fortunately. Maybe it was because we didn't do quite as radical surgery as we usually do.

I questioned whether or not I was at fault in doing an iridencleisis because of the duration of the tension. I didn't want to do anything too radical, knowing hypotony had been present. I felt as thought the iridencleisis might be the least radical procedure.

Dr. F. H. Verhoeff: It seems to me that hypotony didn't cause the separation, but that the trauma caused the separation, caused serum to form, and hypotony made it persist. Of course, even if you had a little hypotony after you got rid of the separation, then the hypotony wouldn't be sufficient to cause the retina to come right off.

Dr. J. Igersheimer: I think this case of Dr. Judson's is of great importance and interest in several ways.

First of all, when you have a case with a high myopia and a tendency for detachment, and even a real detachment, and you have at the same time a glaucoma, the question arises, should we operate? I would be very interested in what the members of this society say on this.

In this special case, the iridencleisis was very well tolerated, but should a filtering operation generally be done in a case of glaucoma which has a tendency to detachment? I personally have seen a case in which detachment started, or in which it apparently occurred, after giving an enormous amount of miotics, especially eserine.

Dr. Hermann Burian: It is an interesting thing in itself that this person, aged 21 years, had glaucoma a year previous to the injury. He is a very young person to have glaucoma.

I have always been very much in favor of antiglaucoma iridectomy in an acute glaucoma, with the feeling that the glaucoma will not return after such an operation.

Separation of retina

Dr. Parker Heath, in the main paper of the evening, presented a preliminary report upon massive separation of the retina in infants, juveniles, and young adults. The retinal disease is usually monocular, is painless, and results in blindness of the affected eye. The patients are for the most part in good general health. The five causative relationships reported were probably vascular in origin. The predominating pathologic condition underlying the separation of the retina divides the cases into five groups. The chief pathologic process in each class is: undifferentiated retina and secondary vitreous, edema, hemorrhage, cystic degeneration, and angiomatosis. The retina is separated by one of these causes working in a primary capacity.

Discussion: Dr. Virgil Casten: I'd like to ask Dr. Heath a question. He says this can start in the lens or in the fossa back of the lens or through the retina. I'd like to hear him say just a little more about that. For

instance, how does he mean it would start in the lens?

Dr. Parker Heath: A retrolental fibroplasia may be primarily in the lens because of the congenital absence of the posterior capsule of the lens, which causes a fibrosis which may or may not be attached to a remnant of the hyaloid. It can exist entirely apart, so that the entire posterior wall of the lens is a fibrous button.

It also can be seen primarily in the lens in those cases which have fetal cataract and which have gone far enough to cause disintegration of the lens, and possible rupture, all the way up to the stage of fibrous cataract.

It can also be seen, in children born with a lens that has a very thin posterior capsule persistently attached to the hyaloid, when the lens is stretched by growth and by pulling of the zonule.

The fibrosis can be primary in the lens and it can be in the lens fossa, and it can be a secondary manifestation of any disease in the eye, an incidental pathologic response, just as a scar is a pathologic response.

Does that answer your question?

Dr. Virgil Casten: Yes, but you are talking about an older group than the premature group.

Dr. Parker Heath: This evening we talked about those born maturely, full-term, except in one case of multiple cystic degeneration.

Member: Will you describe the type of case, among those discussed, in which treatment is helpful, and at what age to do it?

Dr. Parker Heath: That is the angiomatosis group. These cases are helped very markedly if they get early treatment. It is really a tumor in the retina. It is helped if it is treated before it extends. The treatment is to obliterate the vessels by diathermy, cutting off the blood vessels, and the thing dies and forms a local scar. That, at the moment, is the only group for which we know anything about a treatment.

Dr. J. J. Regan: Both Dr. Heath and Dr. Verhoeff have used the term "diathermy" tonight, and I think it ought to be clearly understood that you mean electrocoagulation and not diathermy.

Dr. Heath: Exactly—that's right. I stand corrected.

Member: I'd be interested to know how you obtained these 75 eyes. What were the factors leading to their appearance in your laboratory—the clinical findings, in other words?

Dr. Parker Heath: A fair number of these eyes have been received at post mortem from various children's hospitals around the country. A number of them have had a diagnosis of possible intraocular neoplasm. They don't represent one geographic area—some are from Michigan, most of them from New England, some from the deep South.

At one time, as a basis for this study, we examined microscopically 40 so-called normal premature eyes to get a basis from which to interpret findings in the pathologic stage. These eyes, for the most part, have come from widespread sources.

S. Forrest Martin,
Reporter.

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on Ophthalmology

February 16, 1950

Dr. Wilfred Fry, *chairman*

Books for the blind

Dr. Burton Chance presented three books of raised type for use by the blind and gave a brief sketch of the history of the invention of printing of embossed pages.

Roman alphabet and Arabic numerals were the early characters devised which were superseded by dots or "points" as arranged by Barbier and later by Braille. Six dots are arranged in such a form as to be comprehended by pressure of the finger tips. Not all countries have the same arrangement, but it is hoped that the day is not far distant when a universal arrangement will be accepted.

The well-known "moon" type of letters is still used, especially by adults, and is taught in the schools.

It is the intention of the librarian of the college to arrange a classification of books for the blind, and he accepts these offered tonight as the nucleus of the proposed collection, as they express three varieties of characters in active employ.

Intractable postoperative diplopia

Dr. G. L. Tabor, Jr., (by invitation) pointed out that four factors in the pathogenesis of intractable postoperative diplopia, or horror fusionis, can be discerned from an analysis of the cases reported in the literature and the experience of various ophthalmologists. These are not distinct and separate determinants, but one or more factors may be present in any individual case: (1) Anomalous retinal correspondence with or without amblyopia; (2) congenital or developmental deficiency of fusion—that is, complete absence of sensorial correspondence between the two eyes; (3) incongruence of the retinal images (aniseikonia); (4) psychogenic factor.

The most helpful finding before operation in determining the possibility of postoperative diplopia is the absence of fusion of macular images with considerable unsteadiness of the double images. Either prisms or a haploscopic device may be employed in making this test.

Once diplopia is established, treatment consists of orthoptic exercises, suppression training, overcorrecting, or complete occlusion of one eye, and, if necessary, a restoration of the original squint by additional surgery.

Concomitant convergent strabismus

Dr. Glen Gregory Gibson discussed the surgical principles in concomitant convergent strabismus formulated following clinical research. These have been helpful in reducing the incidence of untoward results following surgical procedures on comitant convergent strabismus of both the primary and secondary type. Four main questions have to be answered preoperatively: (1) When should the operation be performed? (2) Which muscles should be selected? (3) Which operation should be performed? (4) How much operative correction should be done?

A knowledge of the binocular reflex development in childhood is very helpful in attempting to answer these questions. This is discussed by Chavasse and is covered by Duke-Elder in Volume 4 of his textbook.

The transition from the undeveloped visual acuity and ocular movement from birth to the age of six, when those functions have reached normal levels, is most important to evaluate. This is true since the reflex development can be modified during these formative years, and cannot be so readily changed after six years of age.

This variability in early life and invariability in later years (past the age of six years) makes it necessary to divide cases into the early and late groups, since the management of the two is so different. Early cases are found in children under five years of age in whom the duration of the esotropia is less than 18 months. Others are late cases.

It is desirable to operate early cases between the age of three and four years, if possible, so that there is still time left for the development of binocular vision. Late cases may wait until any convenient time.

Which muscle should be selected? This is very important even though the muscles are not primarily, but secondarily, involved. This necessitates classifying the activity of the four horizontally active rectus muscles as plus or minus 1, 2, 3, 4, in an attempt to estimate the hypertonicity, or the contracture, or the atony which is present in each muscle.

Rather characteristic rotational groups will be encountered both in the symmetrical and asymmetrical types which will permit the operative attack to be directed to the two most abnormally acting muscles. This determination of muscular action will help to dem-

onstrate whether the operation should be on one muscle of both eyes (usually alternators) or both muscles of one eye (usually monocular cases).

In the answer to the third question—which procedure should be selected?—we have had our most gratifying results with bilateral recession in symmetrical late cases, and with marginal myotomy as advocated by Chavasse in the early symmetrical cases, providing the symmetry was both of the motor and sensory type. In asymmetrical cases, both late and early, recession of the internal rectus combined with resection of the external rectus is preferable.

How much operative correction should be done? In early cases it is not necessary to graduate the amount of correction; whereas, graduated amounts of correction are indicated in the late cases.

The altered physiologic and pathologic basis for these statements together with the disadvantages, advantages, limitations, and objectives of these procedures were discussed.

The main advantage of this system is the avoidance of postoperative overcorrection. The motor results were 92 percent satisfactory at the first operation. Even in the early cases only 30 percent of the patients obtained simultaneous macular perception, and the cause of this was discussed. The importance of the age of the patient, the age of the patient at the onset, and the duration of the condition were reduced to surgical terms. The muscle surgeon must not be dogmatic, but should be as elastic in concept as the muscles are elastic in function.

Discussion. Dr. William E. Krewson, 3rd, in opening the discussion of both Dr. Tabor's and Dr. Gibson's papers said that although both presentations were concerned with ocular muscles, they present entirely different problems.

Dr. Tabor has covered the literature of his subject quite thoroughly, and has shown considerable initiative by obtaining personal communications from numerous contemporaries in the field of muscle surgery. In fact, I think he has left little to be said.

Fortunately, the condition is quite infrequent. While many of our patients with strabismus experience transient diplopia following surgery, very few have prolonged postoperative symptoms. I remember one such patient of the late Dr. Luther Peter who actually requested enucleation of one eye for her annoying, intractable diplopia.

I am happy to say I have had no such case myself, and I know of none that we have had at the Graduate Hospital. Of course, there is always the possibility that we have had such a patient who became thoroughly disgusted with us, and went to some one else.

As Dr. Tabor has indicated, the cause is not known, but aside from the ophthalmic picture, a definite psychogenic factor is probably always present. Since it is human not always to admit our poor results, very likely many such cases are never reported in the literature. I think Dr. Tabor's treatment of his topic has been most inclusive.

Dr. Gibson, on the other hand, has given us the guiding principles which he has formulated as the result of his experience in the surgery of (purely horizontal) concomitant convergent strabismus. The postoperative corrections he has obtained are so enviable that some of his procedures can be used by most of us in our own cases with a great deal of profit.

Dr. Gibson mentioned several points which I feel deserve special emphasis. The first is the ideal time for operation. Unfortunately, we see all too often, what he has described as the neglected case, one in which the deviation is of long standing and in which amblyopia is firmly established.

Many of these patients have reached the age of six or even 12 years; in these, as Dr. Gibson has remarked, the time of operation is not important, although probably the sooner it is carried out the better.

On the other hand, it is in the early case, in the infant who has recently developed a deviation, in which early surgery may be ex-

pected to give optimum results. The successful reëstablishment of normal binocular function can almost be said to be inversely proportional to the age at which operation is undertaken.

In the infant, the binocular reflexes are still plastic and not firmly established, and so, as Dr. Gibson stated, it is in these early cases that the developing sensory mechanism will be of most aid to the surgeon with his mechanical adjustments.

A second point deserving emphasis is that a refined, differential diagnosis is a prerequisite to success. Conceivably, several different surgical procedures could give straight eyes for a given case. However, the goal of operative treatment is to restore function, and not just to create a cosmetic improvement. Hence Dr. Gibson's classification of cases into asymmetrical, monocular and symmetrical, binocular involvement can be most helpful in deciding which muscles to attack.

Personally, I have had no experience with marginal myotomy, but the essayist's arguments in favor of this procedure are quite logical and his statements are very convincing. At the Graduate Hospital we have been using wholly the recession and resection operations, which Dr. Gibson reserves for his asymmetrical and late cases, and we have had no reason to feel disappointed with our results. If the muscle is anchored firmly to the episclera by two or three catgut sutures, there is little chance for the attachment to slip back; moreover, it can be used in most early cases; whereas, the marginal myotomy, as I understand it, is limited to alternating squints.

There is one other, very minor, point on which I might differ with Dr. Gibson, and that is the number of muscles operated at one time.

It is ideal to be able to correct a case of strabismus in one operation. Lately, however, I have became a little more conservative, especially in cases of abnormal retinal correspondence, which, as Dr. Gibson has pointed out, are most difficult to estimate, and those cases in which I suspect an overcorrection may be likely.

If two or three muscles require operation, I confine my efforts to one or two, as the case may be, then wait five or seven days before attacking the remaining muscle. This gives an opportunity to judge more accurately the correction obtained for each muscle, and a second chance for final adjustment.

Admittedly, this method slightly prolongs hospitalization and subjects the patient to additional anesthesia, but I still feel that the ultimate result is to the patient's advantage. As I said, this is a minor point of difference, and not meant as a criticism.

We are indeed fortunate to have had Dr. Gibson give us his working rules for surgery of convergent concomitant strabismus.

Dr. I. S. Tassman: I would like to ask Dr. Gibson the difference between the marginal myotomy, as he described it, and the so-called guarded tenotomy as done by others in the past. Also, whether this was done in cases with monocular squint in which the vision was very poor in the affected eye. The results obtained with Dr. Gibson's procedure were very satisfactory in the group described with a deviation up to 45 degrees. In those cases in which I have seen the so-called guarded tenotomy done, an advancement of some kind was also performed on the opposite muscle.

Dr. Glen G. Gibson: I should like to thank Dr. Krewson for not taking advantage of the many loopholes that are available in the presentation of this type. I wish that it were possible to be less vulnerable than I actually am; therefore, thanks very much for your kindness.

In answer to Dr. Tassman, the marginal myotomy is performed as far back in the belly of the muscle as one can work so as to avoid the tendinous portion of the internal rectus. This permits the muscle to "give" more, and hence it achieves the same results as a recession without as much danger. It is interesting that it usually gives the right amount of correction. In a tenotomy there is

much less relaxation or stretching of the muscle, and the results are less uniform. This procedure is not to be confused with similar procedures which are done on the tendon of the internal rectus.

The second question that Dr. Tassman asked was in relation to instances in which the vision is different in the two eyes. This is a very crucial point, as it is important that anybody who attempts this procedure understand the answer to the question. If the vision is unequal in the two eyes, the operation will not succeed. It requires that the vision be equal if not normal in both eyes before subjecting the patient to the procedures of marginal myotomy.

He also asked about the results in those cases with deviations up to 45 degrees. Certainly, a 45-degree correction is the maximum that we can obtain by marginal myotomy. It is preferable to apply this procedure to cases of smaller degree particularly those that are variable.

Dr. Tassman mentioned the effect of other muscles. It is vitally important in marginal myotomy that you do not combine procedures to the external rectus muscle at the same time, because in so doing, you would increase the stretch on those residual fibers which are left in the muscle. Resection or other procedures to the external rectus muscles are contraindicated at the time of doing a marginal myotomy.

M. Luther Kauffman,
Clerk.

LOS ANGELES OPHTHALMOLOGICAL SOCIETY

January 5, 1950

DR. DEANE C. HARTMAN, *chairman*

SYMPOSIUM ON SECONDARY GLAUCOMA

DR. I. G. SOMMERS reviewed the pathology of the condition of increased tension which appears after other pathologic changes have occurred in the eye, and is termed secondary glaucoma. Pathologically, primary glaucoma simplex has been found in several cases to be due to thrombosis of vortex veins. The cause of poor aqueous circulation following anterior and posterior synechias was demonstrated with slides, and glaucoma following obstruction of the central retinal vein was reviewed. Other preparations showed interrupted orbital circulation by tumor and inflammatory masses.

DR. RICHARD C. ARMSTRONG stressed that the diagnosis depends upon being aware of the diseases which can cause secondary glaucoma. One must rule them all out before deciding that the increased tension is primary rather than secondary. At present 30 percent of all intraocular hypertension is considered secondary, and this will probably increase as progress in diagnosis is made. The eye must be observed carefully for the classical signs of uveitis, dislocated lens, cataract, exfoliating lens capsule, disorders of ocular vessels, tumors, and congenital anomalies.

Since a patient with primary glaucoma can also develop a cause for secondary glaucoma, a therapeutic trial may be the best diagnostic aid. In suspected iritis it is wise to start with homatropine which can be counteracted by miotics. The history is helpful in cases following trauma or intraocular surgery.

DR. WENDELL C. IRVINE discussed medical treatment of secondary glaucoma. In cases due to trauma by blunt injury, the use of miotics is usually restricted to those without hyphemia; this is especially true in adults. Treatment must be suited to the individual case after careful, complete examination. In uveitis with secondary glaucoma, treatment is hampered by our lack of knowledge of the vascular physiology of the anterior segment. The uveitis should receive the routine care and mydriasis should at least be given a trial. These eyes generally tolerate increased tension better than those with primary glaucoma.

In aphakic glaucoma DFP seems to be the drug of choice, if used cautiously, and each

case must be individualized. At best, all treatment of secondary glaucoma is generally discouraging.

DR. MAURICE NUGENT discussed treatment from the surgical standpoint. The treatment must follow determination of the cause. It might be well to classify all cases as secondary. Glaucoma secondary to angle embarrassment by synechia is best treated by wide basal iridectomy. In iris bombé, transfixation is usually the operation of choice. When the angle is embarrassed, cyclodialysis, in addition to or combined with iridectomy, may be performed.

Aspiration is preferred over paracentesis, if the quality of the aqueous is affected by an inflammatory process. This can be done daily in the office.

Cyclodiathermy is used in hemorrhagic glaucoma, and one may do 360 degrees at two operations.

When treating glaucoma due to lens exfoliation, the intracapsular route is favored. However, if the case proves to be primary and not secondary, in a cataract with glaucoma an expulsive hemorrhage may result.

In glaucoma following trauma, lens or large quantities of unabsorbed blood in the anterior chamber must be removed. Slow reformation of the anterior chamber after cataract surgery may lead to anterior synechia. Here cyclodialysis is the procedure of choice should the synechia lead to secondary glaucoma.

Orwyn H. Ellis,
Recorder.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

January 10, 1950

EARLY OCULAR PEMPHIGUS

DR. DANIEL F. FISHER AND DR. D. H. ANTHONY presented the case of a Negress, aged 57 years, first seen on December 7, 1949. She said that on October 6, 1949, she saw her family physician in a neighboring state for general malaise. She was told her blood pressure was high and was given one injection in the arm and, one week later, another injection. One week after the second treatment, she had a generalized eruption over her body. Within two days, the eyes became painful and vision failed sharply.

On examination, there was light projection in both eyes. The eyes were moderately injected; lids normal; almost the entire center of both corneas showed a very dense gray opacity, slightly less in the exact center. Slit-lamp examination did not penetrate most of the opacity but the center of the cornea was extremely thin. There was a very faint stain with fluorescein. The patient was thin and undernourished and the entire skin of her body showed splotchy areas, as if there had been a mild depigmentation. Nose and throat were normal.

She was given atropine three times daily, Sulfacetimide ointment three times daily, and was told to keep both eyes patched.

A letter to the doctor who gave the injections as to their nature was not answered. Her present physician has done a blood Wassermann (negative) and administered penicillin a number of times.

On December 14, 1949, examination showed that some of the opacity was receding. Dr. Richard Miller saw this patient and suggested benadryl with the possibility that the condition might have been an allergic reaction. This was given. On December 22, 1949, there was no change but patient was more comfortable. On January 9, 1950, the patient reported feeling more comfortable, the opacity of the cornea had receded somewhat at the periphery but fairly large and gray bullae showed from underneath both lids and there also was beginning perivascular connective-tissue proliferation. The patient was seen by Dr. Vonnie Hall and Dr. Emmett Hall who thought the high lesions probably were pemphigus. Complete skin examination showed no pemphigus lesions. Dr. Vonnie Hall thought the skin condition re-

sembled an arsenical reaction. The patient has been placed on 250 mg. aureomycin every six hours.

Diplopia due to brain tumor

Dr. Roland Myers presented the case of Miss M. A., aged 25 years, who was seen on December 28, 1949, with a history of occasional transient diplopia, with blurring of vision when doing close work, for one month. Twitching of right lower eyelid, an occasional headache, and constipation for two weeks were also noted.

Vision was: R.E., 20/25—, J1; L.E., 20/25—J1. Homatropine refraction was: R.E., + 2.0D. sph. ⊂ + 0.5D. cyl. ax. 90° = 20/20—2; L.E., + 2.0D. sph. ⊂ + 0.25D. cyl. ax. 45° = 20/20—1.

Muscle balance for distance, three degrees esophoria; at 33 cm., six degrees esophoria; three degrees esophoria in the left horizontal field; and two degrees left hyperphoria. Left lower field, six degrees of esophoria and four degrees of left hyperphoria. Pupillary reactions were normal. Fundus examination revealed a five-diopter choking of each disc. With a one-degree target at 33 cm., a right incongruous homonymous hemianopia was found.

The eye findings suggested an intracranial lesion involving the left optic tract, left 3rd and 6th cranial nerves, producing a right incongruous homonymous hemianoptic field defect and paresis of the left inferior rectus muscle and left external rectus muscle.

The patient was advised to have a neurosurgical consultation. The neurosurgeon reported: During the performance of a ventriculogram the patient lost consciousness for about five minutes. This was believed due to a shift in the intracranial contents. A left temporal craniectomy was performed. A generalized edema of the brain was present and a soft tumor, the size of a large orange, was found involving the left temporal lobe and extending to within one centimeter of the surface of the left occipital lobe.

Grossly, it contained dark blood, indicating past hemorrhaging into the tumor, and resembled either a glioblastoma multiforme or astrocytoma, extremely malignant.

The first 15 hours of the postoperative course were good; suddenly the patient developed a ptosis of the left upper lid, the left pupil became dilated, and respiration ceased. The cause of death was thought to be due to a herniation of the left temporal uncus through the tentorium cerebellum. Pathologic diagnosis of the tumor was glioblastoma multiforme.

Keloid of conjunctiva

Dr. Philip Meriwether Lewis presented a patient with keloidlike changes in the conjunctiva following iridencleisis. This patient, a white woman, aged 54 years, had been presented before this society in June, 1948, because of a very large conjunctival bleb of the right eye, which followed an iridencleisis operation in August, 1945. This mass was excised and proved to be composed of fibrous tissue with stellate cells indicating continued proliferation. The surface epithelium was atrophic. (Report from H. C. Wilder of Army Institute of Pathology.)

Iridencleisis was performed on the left eye in July, 1947. A similar growth formed on the left eye and gradually enlarged to its present size. It extended from two mm. above the limbus downward over the upper one third of the cornea and was elevated about 2.5 mm. above the level of the cornea. The anterior chamber was very shallow and the tension only 8 mm. Hg (Schiøtz). Since the iridencleisis operation in 1947, vision has been only 20/100. It has now decreased to 4/200.

The right eye has done well since the growth was removed in 1948. The tension rose to 34 mm. Hg (Schiøtz) for a short while but has remained about 12 mm. Hg since September, 1948. A cataract has been developing slowly, vision being only 20/100.

Daniel F. Fisher,
Recorder for Eye Section.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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THE LOS ANGELES MIDWINTER COURSE

The establishment of the short intensive postgraduate course by Edward Jackson in Denver was followed by similar courses in various parts of the country. The usual pattern is to have one or more guest speakers who give a number of lectures on subjects in which they are particularly interested or discuss abnormalities with which they have had a good deal of experience.

With the cessation of the Denver course the midwinter course of the Los Angeles Research Study Club, established in January of 1932, is the oldest continuous course of this type. This year the 20th annual midwinter "convention" was held from January 10th through January 26th, inclusive, the first week being devoted to ophthalmology.

It is noteworthy that in these troubled, unsettled times 320 physicians registered during the first week. Of this number 225 were ophthalmologists. Twenty-six states, Canada, and the Hawaiian Islands were represented, a number coming from states on the eastern seaboard and from states in

the middle west and south. The guest speakers were Derrick Vail and Irving Puntenney of Chicago, Frederick C. Cordes of San Francisco, and Archie Cruthirds of Phoenix, Arizona.

Dr. Derrick Vail discussed various mechanical phases underlying cataract surgery, stressing the importance of the principles of the "Smith-Indian" operation. His additional subjects were the prevention and treatment of immediate postoperative cataract complications; glaucoma in aphakia; ocular complications of joint diseases; eyeball shortening operations and the "chiasmal syndrome."

Dr. Irving Puntenney's lectures were on recent advances in therapeutics, with special emphasis on the place of cortisone and ACTH; unilateral exophthalmos; tumors of the eye and eyelids; central scotomas; and plastic procedures about the eyes.

Dr. Frederick C. Cordes discussed congenital cataracts and their surgery. Dr. Archie Cruthirds gave a progress report on sulfhydryl therapy in ophthalmology.

Another feature of the course was the daily instruction courses which included ocular hypotony by Dr. John A. Bullis; problems in refraction by Dr. Irving Puntenney; considerations in retinal detachment surgery by Dr. Carol L. Weeks; ophthalmic forum by Dr. Harold F. Whalman; and orthoptics in office practice by Dr. Warren A. Wilson.

Round-table luncheons were held daily at which those attending the course could send questions to the speakers on the subjects discussed. These were then answered. There was a great deal of interest in these luncheons and usually there was not sufficient time available to answer all the questions.

From the above outlined program it is apparent that presentations followed the purpose of the course as outlined by the late Dr. Morie Weyman when he said, "Our endeavor is to be essentially practical; to bring up ideas which members may take home to utilize in their everyday practice."

The entertainment was cared for in the usual lavish southern California manner. Included were receptions, cocktail parties, dinners, and an excellent organ recital by Eva Kurtz Ghrist on the wonderful pipe organ at the Elks Club. In addition, tickets were available for broadcasts at the Los Angeles Breakfast Club and many other outstanding nationwide broadcasts. Another very unusual bit of relaxation was the performance at the Turnabout Theatre. On Wednesday afternoon, which was open, some went to the races at fabulous Santa Anita. It is with regret that we report that "Sea Countess" had a bad day.

At the last round-table luncheon, Dr. A. Ray Irvine told of the editorial in the AMERICAN JOURNAL OF OPHTHALMOLOGY describing the impressive memorial service for Sir William Bowman, held at the International Congress of Ophthalmology in the remnants of the bombed church of St. James', Piccadilly. He then presented Dr. Vail with a check of $500 from the Research Study Club as the original contribution to a fund to be sent to the rector of St. James', Picadilly, to be used toward the restoration of the church where Sir William Bowman worshipped.

The course of the Los Angeles Research Study Club has always served a very useful purpose in making available to a large group of ophthalmologists a discussion and review of the more important conditions in our specialty, as well as the evaluation of the newer therapeutic agents. During the last war the course was continued and made this information obtainable to many men in the Armed Forces. With some of the services encouraging their men to attend these short courses, it is hoped the Los Angeles group will continue their splendid work. It is planned that next year Sir Stewart Duke-Elder will be one of the guest speakers.

Frederick C. Cordes.

HEED OPHTHALMIC FOUNDATION

Report of activities from inception in May, 1946, until October, 1950

The Heed Ophthalmic Foundation was conceived by Mr. Thomas D. Heed, of Chicago, and his wife, Ruth Heed, in an effort to give additional opportunities for surgical experience and study to young ophthalmologists of exceptional ability. It was Dr. Harry S. Gradle who first interested the founders in this undertaking.

They felt that frequently the contribution which such men might be able to make toward the advancement of the science of ophthalmology was lost, either through the pressure of finances, or the lack of entree to the best institutions of the nation. It was their belief that many deserving young men, who married or had incurred other obligations upon the completion of the usual curriculum, although such actions were eminently proper and right, were thereby forced to abandon their studies prematurely for the more lucrative field of clinical ophthalmology.

After consultation with leading ophthalmologists from various parts of the country, a trust agreement was therefore drawn up, and five directors were appointed to carry out the details of the program.

In the beginning, the possibility of establishing surgical fellowships was investigated, and letters were written to 12 of the major clinics of the country, seeking such fellowships. The replies, however, soon made it evident that it was not practical for the various university clinics to grant surgical opportunities to men other than those in training in their own institutions, no matter how exceptional might be the ability of such men. The plan, therefore, had to be altered. The founders readily agreed to all suggestions made by the board of directors, and gave up the idea of surgical fellowships, accepting in their stead the arrangement which is now in operation.

The procedure is very flexible and permits great latitude on the part of the board of directors. The usual program is based on a six-month period, which may be prolonged to one year or more, as may seem desirable. The time occupied by the usual six-month period is divided between three situations, no less than two months being spent at any one station. It has been felt that any shorter stay precluded the Fellow from becoming an integral part of the organization and held him in the role of a visitor, so to speak, rather than a temporary member of the staff. In each clinic the work is assigned under the direct supervision of the chief of staff.

Thus far, the Fellows have been afforded the opportunity of attending all lectures, demonstrations, and surgical procedures in the same manner as the regular residents of the institution, with similar privileges, except those of performing surgical operations. In a few instances, such operative privileges have been granted to a limited extent. In addition, the Fellows have also been encouraged to undertake simple research problems, though the time limits are such as to preclude elaborate programs of this nature, even though the problem may be carried from one clinic to the next.

In exceptional cases, other courses of study have been offered. One Fellow spent six months working in histopathology at one institution, and was granted an additional six months of similar study at another station. At the present time, one candidate is under consideration for special training in the management of problems in ocular motility. Thus, it can be seen that the Heed Foundation is carrying out the ideas of the founders in helping men who give promise of exceptional ability.

Up to the present time, two men have had one year's training, and six others have had six months' training. In one instance, withdrawal was forced, because of illness in the family, at the end of the first two months. At the present time, there are three Fellows

in the midst of their training. All those thus far accepted have proven to be men of outstanding ability and are giving such promise that the founders and directors of the foundation have felt great satisfaction with what has been accomplished.

Great credit should be given to the various chiefs of clinic, their staffs and their institutions, who have assisted in this program. Among such should be mentioned:

The Department of Ophthalmology of the University of California School of Medicine.

The Department of Ophthalmology of Columbia University College of Physicians and Surgeons.

The Eye-Bank Laboratory of the Manhattan Eye and Ear Infirmary.

The Department of Ophthalmology of The Johns Hopkins University School of Medicine.

The Massachusetts Eye and Ear Infirmary.

The Department of Ophthalmology of Northwestern University School of Medicine.

The Department of Ophthalmology of the University of Oregon School of Medicine.

As in all other matters pertaining to the management of the fellowships, the founders have left the details concerning the stipend to the discretion of the board of directors. The amount has been established with a view to rendering assistance to a number of candidates, rather than concentrating too highly on one or two at a time. An effort has been made to adjust the remuneration at such a level as to avoid the possibility that applicants might look upon the compensation as a complete livelihood but rather as an assistance in carrying on work which they greatly desire. The idea has been that, established on its present basis, the fellowship will attract those who realize the rare opportunity which is granted them of access, on the most intimate and instructive basis, to the finest teachers and clinics in the country.

There has been no effort to solicit the name of any candidate, other than to let it be known from time to time that one or more fellowships were open to those having the necessary qualifications.

In addition to the exceptional qualifications already outlined, it is required that all candidates be citizens of the United States. Following out this stipulation of the trust agreement, it has been necessary to refuse fellowships to several most desirable candidates, but should they have been accepted, equally fine men of American birth would have been denied the opportunities offered.

M. Hayward Post.

CORRESPONDENCE

NATURE OF INCLUSION BODIES IN TRACHOMA

Editor,

American Journal of Ophthalmology:

In his article in the December, 1950, issue of the JOURNAL entitled "The nature of inclusion bodies in trachoma," Dr. Henry Grossfeld denies the existence of "initial bodies" and "free initial bodies" and concludes that elementary bodies are the only form of the virus of trachoma. The initial-body-elementary-body cycle of morphologic variation is one of the striking characteristics of the psittacosis-trachoma-lymphogranuloma venereum group of viral agents and one of the features which set this group apart from the typical large viruses like vaccinia virus and fowlpox virus in which the elementary body is indeed the only recognizable virus form.

This cycle of morphologic variation observed in trachoma was clearly demonstrated in psittacosis, both in mice and in tissue culture, by the classical studies of Bedson and Bland, and in lymphogranuloma venereum by Rake. In inclusion blennorrhea, in which the virus is particularly abundant, this cycle of intracellular development from elementary body to initial body and back to elementary body in about 48 hours is seen particularly well in scrapings made during

the incubation period when as many as three complete cycles can be demonstrated.

It is not a complex cycle comparable to that of the malaria parasite but is to be compared rather with that of many bacteria which in their first few divisions in a new medium show giant swollen forms.

In trachoma the designation "initial body of Lindner" refers to the swollen forms that occur in the first few intracellular divisions of the virus. Since the initial-body phase is intracellular, free initial bodies are rare and only result from premature rupture of cells containing immature inclusions.

To an observer familiar with the cytology of conjunctival scrapings and follicular expressions, no great difficulty should be encountered in differentiating initial bodies, either free or intracellular, from artefacts of various sorts, cellular debris, platelets, pigment granules, basophil and eosinophil granules, and so forth. It is most unlikely that they would ever be confused with the cytoplasmic bodies, mainly phagocytosed nuclear debris, of the Leber macrophage, as Dr. Grossfeld suggests in Figure 3 of his color plate.

In many thousands of examinations of material from nontrachomatous conjunctivitis I have found initial bodies, free or intracellular, only in inclusion conjunctivitis and a single case of conjunctivitis due to lymphogranuloma venereum.

Dr. Grossfeld's conclusion as to the initial bodies of trachoma, which I believe to be erroneous, detracts in no way from his other conclusions which seem to me to be important and of great interest.

(Signed), Phillips Thygeson,
San Jose, California

DR. GROSSFELD'S REPLY

Editor,
American Journal of Ophthalmology:

The letter of Dr. Phillips Thygeson, whose work has contributed to our knowledge of the etiology of trachoma, requires a more detailed reply.

The idea of the occurrence of a developmental cycle in the psittacosis-trachoma-lymphogranuloma inguinale group of filtrable viruses has found its main support in the work of Bedson and Bland (Brit. J. Exper. Pathol., 13:464), and Bland and Canti (J. Pathol. and Bact., 40:236) on the morphology of the virus of psittacosis. In their work in mice, and especially in tissue cultures infected with psittacosis virus, the authors conclude:

1. The virus of psittacosis occurs in forms other than elementary bodies.

2. The virus passes through a developmental cycle, the cycle being: "elementary body → amoboid forms running together to form a plasmodium → morula (a homogenous plaque not consisting of granules) → division and subdivision of elements of morula → elementary bodies."

"The early stage of division of the plaque into the large virus forms was seen," the authors say, the plaque or plasmodium being described as a homogenous body of the size of cell nucleus, without granules.

Now these findings carried with them the implication that the psittacosis group is unique among all filtrable viruses in the mode of reproduction through an intricate cycle. The dilemma arose: Either to accept the occurrence of developmental cycles in filtrable viruses (which, out of theoretical considerations, seems most improbable); or to consider the psittacosis group as Metazoa, or perhaps Myxomycetes, or Microsporidia. In fact, this latter view has been adopted by Bedson and Bland.

But this dilemma surprisingly has been solved in a quite different way.

The findings of Bedson and Bland and Bland and Canti, since the publication of their papers in 1932 and 1935, have been verified by numerous authors, and have not been confirmed by any of them (J. Fortner, Pfaffenberg, and others). In addition, R. Doerr, out

of general considerations, emphasized his great doubts on these findings. As a matter of fact, these findings could not be confirmed.

The tissue-culture experiments of Bland and Canti, to judge from their illustrations, could not prove anything concerning the mode of reproduction of the virus. The living-tissue-culture cells in dark-field illumination show nothing else but various cytoplasmic particles regularly encountered in living-culture cells in a liquid medium in dark field.

So, for instance, in Figure 6, Plate XXVIII, to which, in particular, Bland and Canti refer, we see only various unidentifiable particles in the cytoplasm of living cells in tissue culture as they always appear in dark-field illumination.

Virus particles of the psittacosis group have yet never been seen in tissue culture in dark-field illumination. (I have tried for years in vain to identify them in dark field in infected tissue cultures.) Bland and Canti state that virus particles can be distinguished from cytoplasmic particles in dark field even by their Brownian movement, the first reflecting white light ("comparable with moonlight"), the latter gold light ("comparable with sunlight").

Brownian movement varies, of course, at different parts of the cytoplasm depending upon viscosity and particle size; their light may also vary with the chemical nature and physical properties of the media—but how virus particles could be identified, Bland and Canti did not disclose.

The fact that the agents of the psittacosis-trachoma-lymphogranuloma inguinale group multiply only in living cells and cannot be studied in pure culture, and that one is dependent on microscopic preparations of infected tissue, makes the task difficult, and misleads to constructing developmental cycles.

If, for instance, staphylococci would multiply only in living cells, and one would depend only on the microscopic preparation, the simple mode of reproduction through division could remain uncertain.

The occurrence of variation in the form of the virus found, for instance, in the virus of psittacosis by their first observers (Lillie, Coles; Levinthal—"Microbacterium polymorphe psittacosis") must not mislead to artificial constructions of hypothetical developmental cycles. Pleomorphism does not at all prove biologic dimorphism with developmental cycle. The division of cocci does also involve some morphologic changes before and after division.

The numerous pictures of preparations which completely discredit the specificity of so called "free initial bodies" could not be published for the reason of space limitation.

The idea of developmental cycles in the reproduction of filtrable viruses of the psittacosis - trachoma - lymphogranuloma inguinale group should definitively be abandoned.

(Signed) Henry Grossfeld,
New York.

BOOK REVIEWS

PHYSIOLOGY OF THE EYE—CLINICAL APPLICATION. By Francis Heed Adler, M.D. St. Louis, The C. V. Mosby Company, 1950. Cloth binding, 709 pages with 319 illustrations, including two in color; chapter references, and index. Price: $12.00.

About 20 years ago an editorial in this JOURNAL by the late Harry Gradle lamented the absence of a detailed account of the physiology of the eye in the English language. The challenge was met by Adler's pioneering volume, *Clinical Physiology of the Eye*, which has since set the pattern in this field—"a small textbook giving in as simple terms as possible the fundamental facts and generally accepted theories of how the eye functions."

At long last the obligation to bring the material up to date has been more than fulfilled, for Adler presents, not a mere re-

vision, but an entirely new book with emphasis on the noteworthy achievements of recent years. The present work, which has a slightly different title from its predecessor, has a larger sheet, smaller type, and almost twice as many pages, though thinner; so that the convenient thickness remains unchanged. To make room for newer material some details found in the original version are no longer mentioned, such as the vestigial retractor bulbi muscle; many former discussions are streamlined, while nearly all citations to the relatively older literature have been deleted. Consequently, the original work still remains a valuable aid to the investigator.

In dealing with the trigeminal pupillary reflex the usual view, initiated by Behr, of connections between the trigeminal and sphincter nuclei is mentioned, but Adler is the only textbook writer who properly emphasizes the more likely mechanism of vasodilator axon reflexes. On another controversial point, Adler evidently holds with Mutch that certain fibers in the facial nerve are the sole efferent pathway for both reflex and psychic tearing. Though prominence has been given recent research, this fine book has still not caught up with all significant contributions, such as Pirie on hyaluronidase, Willmer on color vision, and Weekers on flicker-fusion fields.

The book sparkles with pointed clinical suggestions. Adler contends that, in cases of squint without any fixation, it is extremely unlikely that patching the good eye will ever bring back visual acuity. As to the cornea, he points out that anesthetic ointments containing nupercaine or phenacaine are the least deleterious. However, the important Schirmer test is neglected; apparently among popular treatises the only adequate description is in Vail-Gifford's *Handbook of Ocular Therapeutics*. A few errata have been noted: On page 39, the ectodermal layers of the cornea are obviously confused; on page 82, milliliters is substituted for millimeters; and the last line of page 95 has "on" for "or"; but only rarely must one consider what is meant for what is said.

This is a masterly work, written interestingly and authoritatively and in a manner as fresh and informal as it is vigorous and informative. The profuse illustrations really illustrate, as a glance at the clues to depth perception will readily reveal.

James E. Lebensohn.

RECENT ADVANCES IN OCULAR PROSTHESIS. By J. H. Prince. Baltimore, The Williams & Wilkins Company, 1950. Clothbound, 155 pages, 89 illustrations. Price: $4.00.

This is an addition to the earlier book by the same author entitled *Ocular Prosthesis*. In fact, a little more of the first book might well be included in the one here reviewed. For example, at least in two places a test described in the first book is referred to, but not sufficiently described for the reader if he does not have that reference.

The first chapter gives the technique of four methods of making the prosthesis. The detail is sufficiently specific. Sources of error are given and means of avoiding these. Various materials are discussed. A wax model made from a Zelex impression is the author's choice.

Chapter II gives experience with various implants including ring and peg types. The number of cases is few compared to those seen by most American ophthalmologists. To date, the author had only one record of extrusion of a peg implant. However, most American ophthalmologists have found that extrusion is not uncommon.

Details of surgery utilizing the various implants are given. Then follows the technique for fitting the peg to the prosthesis.

The Troutman magnetic implant is discussed with instructions for its use. Objections cited are occasional pressure necrosis and slippage when the prosthesis meets the canthus. The technique of employ-

ing the Cutler and Stone-Jardon implants is adequately given.

Chapter III describes a few unusual cases. Chapter VI discusses the properties of methyl-methacrylate. Chapter VII is about the preparation of artificial irises, and the final chapter is on the making of an acrylic eye.

The book is interesting, but in a field that is changing so rapidly it may rather soon be out of date.

Lawrence T. Post.

TRANSACTIONS of the Société Française d'Ophthalmologie de Paris and of the Sociétés d'Ophthalmologie de l'Est, de Lyon et de l'Ouest, 1948, December, No. 10, pp. 727-825.

A new method of intraocular application of penicillin was introduced by H. Miller. After local anesthesia, retrobulbar injection of novocaine and adrenalin, and injection of the same solution in the superior and lateral rectus muscles and subconjunctivally in the superior temporal quadrant, two fixation sutures are placed over the superior and lateral rectus to give the eyeball its utmost internal and inferior rotation.

The conjunctiva and Tenon's capsule are dissected as far back as possible and an oval space on the sclera is exposed, measuring about eight mm. by six mm. Four or five incisions are made in the sclera just to reach the external surface of the choroid. Tenon's capsule and the conjunctiva are closed most carefully to give a real complete union.

Penicillin, 100,000 to 200,000 units in one cc. of physiologic serum or distilled water, are injected subconjunctivally, whereby the needle, following the bare sclera, is pushed forward toward the place of scarification. Care must be taken to avoid oozing through the suture line. The so-called laterobulbar injection may be repeated after 48 hours without hazard. This method of penicillin application is recommended for severe infections of the posterior segment. Two case histories are given as proof for the efficiency of this treatment.

T. Haas describes some tables covering the dioptric values of air-contact glass, contact glass-fluid lens, and air-cornea for the fast computation of the strength of the contact lenses. In another paper, he discusses the visual acuity in hemianopia.

P. Cernea and G. Offret have used electrosurgery in otherwise unresponsive orbital tumors. The coagulation is done plane by plane and the destroyed tissue is removed with a curette. The coagulated tissue is gray or white but the structure is preserved so that the tumor tissue is easy to distinguish from the healthy part.

A. Dolfus reviews his experiences with DFP in chronic and secondary glaucoma as well as in a patient with internal ophthalmoplegia and surgical paralysis of the fifth nerve, but without any increased ocular tension.

G. Offert and Elahyan injected aqueous placental extract retrobulbarly in three patients with retinitis pigmentosa and in one patient with high myopia. J. Sedan removed a cruciform bilateral pterygium and made a sliding conjunctival flap.

Mme. S. Schiff-Wertheimer, who visited the United States in 1948, reported her experiences with enthusiasm.

Belz's case report is the most surprising. A 42-year-old man with retrobulbar neuritis, who was treated unsuccessfully for two years, recovered his vision after a subcutaneous implantation of placenta. Mme. Mata-Vulj had a similar experience with a patient with uveal tuberculosis, and Paufique and Hugonier call the improvement in a case, already unsuccessfully operated upon for retinal detachment, a miracle.

Paufique and Prost cauterized the diseased corneal parts in a case of progressive marginal atrophy with trichloracetic acid and prevented further progression. Couadau and Darbron used streptomycin (50 mg. to 1.0

cc.) locally in a progressive corneal ulcer caused by a Gram-negative bacillus which did not react to any other form of treatment. Belz emphasized the importance of the relative hemianopia in the localization and evaluation of intracranial lesions.

P. Bonnet was surprised about the quietness and immobility in the fundus in a patient with auriculoventricular block. E. Blanc and G. Bonamour think that the syndrome of the section of the optic nerve, namely, amaurosis, mydriasis, and disappearing of the light reflex, sometimes might not be caused by direct trauma to the nerve, but by a reflex spasm of the central artery. They describe a similar case in which a temporary amaurosis preceded the development of a pulsating exophthalmos.

Other papers dealt with a keratitis caused by a caterpillar hair (Paufique and Durix), recurrent retinal hemorrhages (Bonnet, Belz, and Couadau), mescaline as a vasodilator (Chaumerliac and Roche), and a case of Laurence-Moon-Biedl disease, treated with a pituitary transplant (Paufique and Guinet).

Belz, Couadau, and Vincent presented a case with grouped pigmentation; Paufique and Guinet observed three young persons with melanotic tumors of the choroid.

Bercher, Belz, and Barret consider Sjøgren's syndrome an imbalance in the glandular, parasympathetic, and sympathetic system, possibly caused by infection.

Bonnet and H. Chavanne cauterized first one vortex vein, later the ciliary body, in a case of hypotony of many months' duration, following a contusion of the eyeball with a pine cone.

Alice R. Deutsch.

THE CAUSE OF BLINDNESS IN ENGLAND AND WALES. By Arnold Sorsby. Medical Research Council Memorandum, No. 24. London, His Majesty's Stationery Office, 1950. 42 pages.

In this survey based on 19,149 certificates of blindness, extensive data are displayed in tabulated form and their significance is analysed. There certainly was no striking increase in the incidence of blindness but neither was it possible to demonstrate a decrease. Considerable modifications in the relative importance of the different causes have been demonstrated in childhood but changes must also have occurred in the adult population. Tuberculosis, syphilis, and trachoma must be less significant as a cause of blindness in adults than they were in the relatively recent past. Problems and prospects are also discussed.

F. H. Haessler.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

D'Ermo, F. **Pharmacologic investigations on the isolated iris muscle.** Boll. d'ocul. **29**:457-479, July, 1950.

The sphincter muscle of the iris of cattle, horses and asses and the dilator muscle of the iris of rabbits and chickens were used; after enucleation, the eyes were kept in ice-cooled physiologic salt solution for two to three hours. A circular incision, 1 or 2 mm. from the limbus removed the cornea, very fine silk sutures were inserted at a distance of from 2 to 3 mm. from each other into the iris muscle and one of the sutures was used to suspend the muscle in physiologic solution at 37 to 38°. The other suture was connected with the writing lever of a kymograph. Air bubbles provided oxygen. The very light writing lever was made of aluminum, and suspended with watch jewels to make it easily movable. The muscle strips used were not heavier than 12 to 14 milligrams each. A single specimen was not used longer than 20 to 30 minutes. Of this time, 10 to 15 minutes had to be used to allow for relaxation of the specimen before the experiment proper. Addition of 0.2 cc. of a 1/100 solution of sodium hydroxide increased the muscle tonus; the same amount of hydrochloric acid reduced the tonus (graphs). While acetylcholine produced contraction of the sphincter even if only 0.1 cc. of a 1/10,000 solution was added, eserine had no effect even in 1-percent solution. If, however, the muscle had been exposed to eserine, the acetylcholine effect became much more obvious. Pilocarpine had more effect on the sphincter than acetylcholine. Mecholyl was active in dilutions up to 1/1,000,000, while doryl (carbaminoilcholine) was less potent. Gynergen (ergotomine) had no effect. The same was true for insulin; histamine produced a marked constriction even in dilutions up to 1/1,000,000. Both atropine and scopolamine (solutions 1/100 and 1/1,000) produce a reduction of a tonus of the sphincter. Similar actions were recorded after administration of cocaine and of adrenaline. The same is true of novocaine, pharmocaine, butocaine. Among the synthetic antihistaminics relaxation of the sphincter was observed from privine, antistine, benadryl, paraminobenzoic acid, tephorine and fargan; stimulation was

exerted by antergan (dimetina) and by neo-antergan even in dilutions up to 1/10,000. The iris dilator muscle does not show as marked changes as does the sphincter. Graphs and their description by the author indicate ambiguous results from atropine (even in 1/50 solution), insulin, adrenaline, and practically no effect of eserine, pilocarpine, acetylcholine, the local anesthetics and the antihistaminics. (31 graphs, 2 figures, 26 references)

K. W. Ascher.

Fournier, J. C. M., Conti, O., Carriquiry, P., and Vanrell, F. G. **Therapeutic action of hypophyseal extracts in various ocular affections.** Arch. d'opht. **10**:453-460, 1950.

The authors employed an extract of the intermediate and posterior lobes of the pituitary glands of cattle, which was lacking in oxytoxic and vasopressor action but which showed strong melanophoric activity, in the treatment of retinitis pigmentosa, albinism, diabetic retinitis, myopia, disseminated choroiditis, hypertensive retinopathy, and senile macular degeneration. It was used both by subcutaneous injection and by instillation into the conjunctival sac. In 22 cases of retinitis pigmentosa, 17 showed improvement in visual acuity and hemeralopia. In some an increase in the field of vision up to 5° was noted. In 5 cases of albinism 3 showed an improvement in visual acuity; all showed a decrease in photophobia, but none showed any increase in pigmentation. In 22 cases of diabetic retinopathy, 18 showed an improvement in acuity which became manifest between 30 and 60 minutes after conjunctival instillation. In 12 cases of myopia 10 showed some improvement in acuity. A single case of disseminated choroiditis in a 13-year-old boy showed no improvement in the right eye but slight improvement in the left. In 2 cases of senile macular degeneration slight improvement was obtained, and 2 of 4 cases of hypertensive retinopathy showed improvement in vision.

The authors discuss the mechanism of action of the extract and discard psychotherapy as a possibility. They conclude that the action is a nonspecific stimulation of the retina.

Phillips Thygeson.

Goldman, H. **The rate of aqueous flow in normal and glaucomatous eyes.** Ophthalmologica **120**:150-156, Sept., 1950.

Goldman's method of determining the rate of aqueous flow through the anterior chamber is based upon the fundamental observation that the concentration of fluorescein in the aqueous, after intravenous administration of one single dose of this dye, remains a small fraction (less than 0.2) of the concentration of diffusible fluorescein prevailing in the blood at the particular moment of the test. Since fluorescein enters the anterior chamber by diffusion and leaves it by diffusion plus flow, the fluorescein lag in the aqueous can be made the basis of estimates of the rate of flow. The actual method consists of fluorescein determinations in the aqueous in situ by an intricate optical procedure (Ophthalmologica 117:240, 1949) and chemical determinations of the free blood-fluorescein at intervals after the intravenous administration of a single dose of the dye. For the normal eye Goldman finds the rate of flow to vary from 1.1 to 2.5 microliters per minute, with an average of 1.9 microliters. For eyes affected with chronic simple glaucoma the range is from 1.3 to 2.5 microliters. The rate of flow in glaucomatous eyes is not significantly different from that in normal eyes. The fluorescein concentration in the aqueous by itself is not a reliable criterion of the permeability of the blood-aqueous barrier. The rate of flow, the volume of the anterior chamber and the prevailing fluor-

escein concentration in the blood have to be taken into consideration since all these factors are interrelated.

Peter C. Kronfeld.

Grant, W. M. **Additional experiences with tetraethyl pyrophosphate in treatment of glaucoma.** Arch. Ophth. **44**:362-364, Sept., 1950.

In a representative group of 60 cases of primary glaucoma, it appears that in controlling the intraocular pressure tetraethyl pyrophosphate is comparable in effectiveness with other strong miotics, but that it offers no outstanding advantages and has the disadvantage of a considerable tendency to induce local sensitization. Also tetraethyl pyrophosphate is susceptible to decomposition by contamination with water. R. W. Danielson.

Kinsey, V. E. **A unified concept of aqueous humor dynamics and the maintenance of intraocular pressure. (An elaboration of the secretion-diffusion theory.)** Arch. Ophth. **44**:215-235, Aug., 1950.

A unified concept of the dynamics of the aqueous humor is presented. This concept involves the production of unbalanced hydroxyl ions and the simultaneous diffusion of all the constituents of the plasma into and out of the posterior chamber. The hydroxyl ions, by reaction with carbon dioxide, are converted to bicarbonate ions, which are electrically neutralized by sodium and other cations diffusing from the blood. The salts formed diffuse into the posterior chamber, thereby maintaining the aqueous humor hypertonic to the plasma. As a result of this hypertonicity, more water diffuses into the posterior chamber than diffuses out again. The excess transfer of water into the posterior chamber dilutes the other substances which are diffusing to and fro between the blood and the posterior chamber; therefore, they exist in lower concentration in the aqueous humor than in the plasma. The aqueous humor thus formed flows between the iris into the anterior chamber. A further exchange of nonelectrolytes occurs across the iris. The electrolytes do not exchange because the blood vessels of the iris are impermeable to ions under normal conditions. All the constituents of the aqueous of the anterior chamber then escape at a rate of approximately three microliters per minute. The influx of water as a result of hydrostatic and osmotic pressures is responsible for the intraocular pressure. The magnitude of the pressure depends on the rate of production of hydroxyl ions in the epithelium of the ciliary body, the ease of outflow at the angle and, to a less degree, the porosity of the blood-aqueous barriers.

Edward J. Swets.

Kinsey, V. E., and Merriam, F. C. **Studies on the crystalline lens.** Arch. Ophth. **44**:370-380, Sept., 1950.

A study was made to determine whether in the lens, too, some of the constituents were rapidly being degraded and resynthesized from their constituent parts. Incorporation of aminoacetic acid (glycine) into lens glutathione and into lens protein was investigated by culturing lenses in a medium containing aminoacetic acid labeled with radioactive C^{14}. The average rate of turnover of aminoacetic acid in lens glutathione was 2.35 percent per hour, and the turnover rate of aminoacetic acid in protein was of the same order of magnitude. These observations suggest that glutathione and protein in the lens are being continuously synthesized from their constituent amino acids.

The rates of turnover of glutathione in lenses removed from animals which were fed naphthalene were greatly decreased. The reduced concentration of glutathione associated with the cataracto-

genic process was thought to result primarily from an inhibition of synthesis of glutathione, probably through poisoning of either the enzyme systems directly responsible for synthesis or those responsible for providing energy for the synthetic process. R. W. Danielson.

Leopold, I. H. **Annual reviews. Pharmacology and toxicology.** Arch. Ophth. **44**:300-348, Aug., 1950.

Leopold presents a most complete and valuable review of the pharmacology and toxicology of the latest drugs of ophthalmic interest. Edward J. Swets.

Malatesta, C. **Quantitative analysis of human and bovine vitreous-body keto-acids.** Boll. d'ocul. **29**:480-483, July, 1950.

The chromatographic method was used to separate the keto-acids of the vitreous body by means of filter paper; αketoglutaric and pyruvic acid were found in higher concentration than in the blood. This is explained by the high metabolic activity of the retina. In 100 gram of vitreous, the αketoglutaric acid content was found 0.65 mgm. in man, 0.72 mgm. in oxen; the pyruvic acid content 0.31 mgm. in man, 0.36 mgm. in oxen.

K. W. Ascher.

McPherson, Jr., S. D. **Use of methapyrilene (thenylpyramine) hydrochloride in ophthalmology.** Arch. Ophth. **44**:405-410, Sept., 1950.

The results of treatment of 120 patients with various ocular diseases who received methapyrilene hydrochloride locally or systemically are reported. Methapyrilene hydrochloride was found to be most effective in the treatment of extraocular disorders of a frank hypersensitive nature. The commonest complication was found to be local irritation after the instillation of the ophthalmic solution. This occurred in 50 percent of all patients treated, and in two patients it was so severe that treatment had to be stopped.

R. W. Danielson.

Mehlhose, F., and Oesterle, G. **Hexamethylenetetramine in herpetic diseases of the cornea.** Klin. Monatsbl. f. Augenh. **117**:169-173, 1950.

The author successfully treated 34 cases of keratitis due to virus infection, such as corneal herpes, keratitis dentritica and keratitis disciformis with daily intravenous injections of 10 cc. of hexamethylenetetramine. It is assumed that the formaldehyde which splits off from the urotropin destroys the virus.

R. Grunfeld.

Merriam, F. C., and Kinsey, V. E. **Studies on the crystalline lens.** Arch. Ophth. **44**:651-658, Nov., 1950.

Evidence is presented to show that the proteins of the lens are continuously being degraded and resynthesized. Glycine labeled with C^{14} in the carboxyl or the methylene position was shown to turn over in rabbit lenses cultured in vitro at a rate between 2.5 and 5 percent per day. This amino acid was also shown to be rapidly converted by the lens to serine, which, in turn, was incorporated into protein at a comparable rate. The amino acid composition of young rabbit lenses as obtained by chromatographic analysis on acid-hydrolyzed proteins is presented.

R. W. Danielson.

Neuenschwander, Max. **Mintacol Bayer, a new antiglaucomatous drug.** Ophthamologica **120**:104-105, July-Aug., 1950.

Mintacol is a diethyl-p-nitrophenylphosphate and, therefore, closely related and pharmacologically very similar to diisopropylfluorophosphate. It is used in aqueous solution of 1:6000 concentration.

Peter C. Kronfeld.

deRoetth, Andrew, Jr. **Metabolism of**

the stored cornea. Arch. Ophth. **44**:659-665, Nov., 1950.

The metabolism of the cornea was studied under various storage conditions. Excised corneas were observed to maintain a normal carbohydrate breakdown for six days when stored in a moist chamber at 2°C. "Intact" corneas, under similar storage conditions, showed evidences of protein breakdown after the first day of storage. A word of caution, however, should be expressed at this point. Corneas stored in the excised state are inconvenient to handle for transplantation purposes; it is difficult to cut out a disc with the trephine from such an excised cornea, because it is not supported in situ by the rest of the globe. Moreover, most surgeons use only 24 to 48-hour-old donor material, during which time there is little, if any, difference in the metabolism of the excised and of the intact cornea.

R. W. Danielson.

deRoetth, Andrew, Jr. **Respiration of the cornea.** Arch. Ophth. **44**:666-676, Nov., 1950.

Excised bovine, cat and rabbit corneas were shown to respire in air. The respiratory quotient of bovine corneas in air was 1.00. The excised bovine cornea maintains a steady rate of respiratory activity in the Warburg flask regardless of the composition of pH of the suspending medium, the gas phase being either 100 percent oxygen or air. Homogenization of the corneal epithelium greatly decreases its ability to take up oxygen.

R. W. Danielson,

Saubermann, G. **Penicillin concentrations in aqueous and vitreous.** Ophthalmologica **120**:27-36, July-Aug., 1950.

The author had the opportunity of obtaining aqueous or vitreous samples from 33 human eyes which, apparently for the treatment of suppurative infections, had been subjected to penicillin therapy in one of the many forms now in use. By determining the penicillin concentration in these samples of intraocular fluid and correlating it with the clinical course of the disease, the author could draw conclusions concerning the relative efficacy of the various forms of penicillin application. Up to four hours after one subconjunctival injection of 100,000 Oxford units of penicillin in saline solution plus procaine the vitreous was found to contain 0.5 or more units of penicillin per cc. The addition of adrenaline, as recommended by Sorsby, produced greater and more lasting penicillin concentrations in the vitreous. Intravitreal injections produced very high penicillin concentration in the intraocular fluids. This mode of application has not found general acceptance because even the purest penicillin is very injurious to retina and choroid. Saubermann reports a very high degree of efficacy of penicillin injections into the anterior chamber (100,000 Oxford units in 0.1 to 0.2 cc. of saline). This form of application, in his experience, is so effective, simple and noninjurious that it should always be used if, in a case of intraocular infection, two subconjunctival injections of penicillin five or six hours apart have not produced a decided change for the better, assuming of course, that one is dealing with penicillin-sensitive micro-organisms. Peter C. Kronfeld.

Sezer, Necdet. **Cultivation of conjunctival and corneal tissue on the chorioallantoic membrane.** Arch. Ophth. **44**:703-709, Nov., 1950.

Rabbit conjunctiva and rabbit cornea can be transplated to the chorioallantoic membrane of the developing chick embryo. The transplated conjunctiva and cornea can be regrafted at least five times. Grafted and regrafted conjunctiva and cornea are capable of supporting the growth of the viruses of vaccinia and herpes simplex. The viruses of vaccinia

and herpes simplex develop intracellular inclusion bodies on the grafted conjunctiva and cornea and can produce experimental keratitis in the rabbit eye.

R. W. Danielson.

Tiberi, Gian Franco. **The eye and the diencephalon. XI. The behavior of "light sense" in the tonus changes of the neurovegetative system.** Riv. oto-neuro-oftal. 25:285-298, July-Aug., 1950.

The writer studied the behavior of the light sense as reflected in the changes of tone of the neurovegetative system using drugs having sympathicotropic and parasympathicotropic action such as pilocarpine and atropine. The results suggest that these drugs have a central action (diencephalic) and that the light sense may respond in different ways to drugs that influence the vagosympathetic equilibrium and to those that act peripherally.

Melchior Lombardo.

Weigelin, E., and Freusberg, O. **The units of measurement in ophthalmodynamometry.** Ophthalmologica 119:292-314, May, 1950.

Standardization of the procedure of ophthalmodynamometry and of the interpretation of its results is the aim of this and previous studies by Weigelin and Freusberg. The existing nomograms for the conversion of the piston pressure values into millimeters of ocular tension are compared and analyzed critically. There is no simple constant relationship between the (unconverted) piston pressure values for the diastolic retinal arterial pressure or of their so-called ocular tension equivalents and the diastolic pressure in the brachial artery. The actual statistical relationship between these three sets of data is worked out by the authors on a large material of their own. Their studies lead to the conclusion that dynamometric investigations of retinal circulation would be more easily interpretable and more directly comparable if each investigator recorded carefully the nomogram used for converting the results into millimeters of ocular tension and also the ocular tension just before the dynamometric measurement.

Peter C. Kronfeld.

Witmer, R. **Para-aminosalicylic acid (PAS) in the treatment of tuberculous ocular diseases.** Ophthalmologica 120: 106-109, July-Aug., 1950.

PAS was given by mouth in daily doses of about 4.5 gm. (after meals, in soup or milk) for five consecutive days followed by a three day rest period. A course of treatment consisted of at least five such eight-day periods. In a few cases PAS was also administered subconjunctivally (in 2.8 or 5-percent aqueous solution). Subjected to this treatment were patients with chronic or recurrent uveitis, sclerosing keratitis, disseminated choroiditis and periphlebitis, all presumably tuberculous. About two thirds of these patients derived a very definite benefit from the treatment. Patients with high cutaneous sensitivity to tuberculin seemed to respond better than normergic or anergic patients.

Peter C. Kronfeld.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Bonneval, G. **Ophthalmometry and astigmatism.** Arch. d'opht. 10:629-635, 1950.

The author discusses the role of the ophthalmometer in measuring astigmatism, both corneal and total. He states that the majority of eyes show an excess of convexity in the vertical meridian over that of the horizontal meridian, varying from 0.5 to 0.75 diopters. In the eyes without corneal astigmatism the total astigmatism usually varies from 0.5 to 0.75, indicating the presence of a normal lenticular astigmatism, which Bonneval

considers primary. In his opinion the corneal astigmatism is an effort to compensate. He calls attention to the findings of Javal, that in high astigmatism at oblique axis the lenticular astigmatism paralleled the corneal as judged by the total astigmatism. In corneal astigmatism of moderate degree and of oblique axis, Bonneval concludes that the lenticular astigmatism is of the normal form. He suggests, therefore, that if this hypothesis is correct it should be possible to calculate the total astigmatism from the corneal findings. A table is presented from which the total astigmatism can be calculated after the corneal astigmatism has been determined. He believes that in the great majority of cases these calculations are valid. Phillips Thygeson.

Brown, E. V. L. **Comparison of refraction of strabismic eyes with that of nonstrabismic eyes from birth to the twenty-fifth year.** Arch. Ophth. **44**:357-361, Sept., 1950.

In keeping with the author's earlier findings and those of his former associates, Kronfeld and Bothman, at the University of Chicago, the average eye is found to become more and more hyperopic up to the age of 6 or 7, not less and less so, as widely held. The nonstrabismic eye, here considered by itself for the first time, also shows increasing hyperopia up to the end of the seventh year.

The timing of the change differs from that found in the nonstrabismic eye. It comes only after the eleventh year in the strabismic eye, whereas a marked decrease of hyperopia takes place in the nonstrabismic eye right after the seventh year. R. W. Danielson.

Liégeois, Guy. **Retinal adaptation and perimetry in reduced illumination.** Arch. d'opht. **10**:495-499, 1950.

Using the instrumentation and technique of R. Weekers and F. Roussel, the author studied 40 normal subjects varying from 20 to 60 years in age and found that the position of the isopters in reduced illumination varied according to retinal adaptation, and that age had no influence on this adaptation as measured by the perimetric method. The effect of exposure of one eye only to light was studied in five normal subjects and it was concluded that the state of adaptation of one eye has no influence on the other. In a third series of 15 normal subjects it was found that there was a direct relationship between the rapidity and amplitude of displacement of the isopter determined in diminished illumination on the one hand, and the duration of the exposure to light on the other.

Phillips Thygeson.

Strebel, J. **A contact lens trial set.** Ophthalmologica **120**:112-118, July-Aug., 1950.

This is a sequel to earlier publications in which the author's original method of fitting contact lenses is described in detail (Praxis **37**:783, 1948). Strebel calls himself an ophthalmologist-technician who is capable of performing most of the steps in the manufacturing and fitting process of contact lenses himself. These lenses ("Plexi-contact-glasses") are made of acrylate polymers by a process of pressing with steel molds. The finished lens is only 0.3-0.4 mm. thick. The fitting is based upon ophthalmometric measurements of the anterior segment. In order to clear the limbus and the apex of the cornea, Strebel routinely uses lenses with two or more zones of different curvature in their scleral (haptic) portion. A lens of the formula 85/5:4/23 has a corneal (optic) portion of 8.5 mm. radius (of its posterior surface) and a scleral zone divided into an anterior ring of 15 and a posterior ring of 14 mm. radius. The last figure (23) denotes the overall size of the lens. The process of finding the most suitable

curvatures is partly mathematical and partly empiric. The method of making lenses from individual molds "is time-consuming and unpopular."

Strabel's results are apparently excellent: "39 percent of our patients wear our contact lenses continuously for 15 hours or longer; 47 percent wear them without difficulties for 10 hours or longer. Only in 14 percent is the tolerance 5 hours or less."

Strebel's trial set contains 50 lenses covering, in 10 steps, the range of corneal curvatures from 7.8 to 11 mm. Of each of these corneal curvatures five lenses with different haptic zones are available in the trial set. The lens with the most suitable haptic zone is determined by empiric tolerance tests. Peter C. Kronfeld.

Vilmar, K. F. **The threshold time of depth perception in the periphery of the retina.** Klin. Monatsbl. f. Augenh. **117**: 242-248, 1950.

The observer looks at a fixation point and at two needles situated vertically one above the other and they are placed to the right or left or above the fixation object. The upper needle can be displaced by the examiner. The minimum threshold time was determined as lying between 154 and 278 msec. Similarly the chronaxia was found to be between 103 and 198 msec. The threshold time increased considerably with excentric observation.

R. Grunfeld.

Wilner, B. I., Weymouth, F. W., and Hirsch, M. J. **Distance discrimination.** Arch. Ophth. **44**:365-369, Sept., 1950.

The authors' experiments on the significance of initial-position settings in the Howard-Dolman procedure for testing binocular distance discrimination have demonstrated that the setting may have a significant influence on the errors of alignment of a subject.

R. W. Danielson.

5
DIAGNOSIS AND THERAPY

Appelmans, M., Michiels, J., Delfosse, J., and Van Assche, E. **Subconjunctival injections of streptomycin in ocular tuberculosis.** Arch. d'opht. **10**:461-479, 1950.

The authors report in detail on the treatment of 18 cases of ocular tuberculosis and conclude that injections of streptomycin are well tolerated after local cocaine anesthesia and that they produce a therapeutic concentration of the antibiotic in the inner eye. Best results were obtained in recently acquired tuberculous disease of the anterior segment. There was little effect in old lesions of low activity but exacerbations responded favorably. Streptomycin solution effected healing of a case of severe marginal ulcer in which all other medication had failed.

Phillips Thygeson.

Arendshorst, W., and Falls, H. F. **Role of the adrenal cortex in treatment of ocular diseases with pyrogenic substances.** Arch. Ophth. **44**:635-642, Nov., 1950.

Neither the present results nor any data in the literature yet provide a satisfactory explanation of how adrenal steroids relieve ocular disease, or any other type of disease. For the present, it must be admitted that we are treating diseases of unknown origin with agents whose site of action is unknown. The intravenous injection of foreign protein initiates an alarm reaction with subsequent response of the adrenal steroids, as shown by a decrease in the eosinophils in the circulating blood. The point of maximal eosinopenja is about 18 hours after the injection. Eosinophil counts can be used to determine the time for the next injection. Patients refractory to foreign protein show no decrease in eosinophils. As evidenced by the eosinopenia, the adrenocortical response parallels the general constitutional reaction to the foreign protein.

R. W. Danielson.

Bangerter, A. **Some plastic surgical procedures.** Ophthalmologica **120**:83-92, July-Aug., 1950.

The author reports her experiences with a number of plastic eye operations. She describes a miniature lid plastic, original with her, aiming at the correction of faulty location of the lower punctum. Mucous membrane folds or actual stenoses of the canaliculus often make a perfect dacryosystorhinostomy ineffective. Such stenoses may be the result of repeated probings. The author, therefore, warns against prolonged nonsurgical treatment of strictures of the canaliculus or nasolacrimal duct.

Bangerter is an enthusiastic advocate of von Blaskovics' advancement of the levator for the correction of ptosis. Mucous membrane from the mouth is an almost ideal substitute for conjunctiva if the graft is made just as thin as possible and well anchored on a solid base (sclera) by means of sutures.

The author excises pterygia completely and covers the defect with adjacent inferonasal) conjunctiva.

Peter C. Kronfeld.

Barkan, Otto. **Goniotomy knife and surgical contact glass.** Arch. Ophth. **44**: 431-433, Sept., 1950.

The technique of goniotomy in treatment of congenital glaucoma has recently been published. In the present communication the description and specifications of the instruments are given.

R. W. Danielson.

Barth Jost. **Further experiences with prolonged iontophoresis.** Ophthalmologica **120**:97-99, July-Aug., 1950.

The typical application of penicillin by means of iontophoresis for periods of 30 minutes or longer has become the routine method of treatment for serpentic ulcers. Iontophoretic application of para-aminosalicyclic acid is now being tried in cases of scleritis, keratitis and iritis.

Peter C. Kronfeld.

Bock, R. H. **A new instrument for lamellar keratoplasty.** Arch. Ophth. **44**: 293-299, Aug., 1950.

Whereas perforating keratoplasty is becoming a common operation lamellar keratoplasty is not very popular in the United States. The author draws attention to its extensive usefulness and to a new instrument which is designed to facilitate the taking of the lamellar graft. The instrument consists of half a razor blade with a thin bar a short distance in front of and above its cutting edge. The bar serves to press the cornea flat, while the blade immediately following it automatically produces an even, smooth cut.

Edward J. Swets.

Bock, R. H. **The clinical measurement of the color of the disc.** Ophthalmologica **120**:174-177, Sept., 1950.

The author's instrument consists of a color standard placed within the beam of the ophthalmoscope in such a way that the observer views the disc and the standard simultaneously and in the same light. The standard is of simple construction: a narrow strip of aluminum is subdivided into seven approximately rectangular areas which have been painted a certain shade of red, varying from each other primarily in saturation. The instrument has proved to be practical.

Peter C. Kronfeld.

Bucy, P. C., Russell, J. R., and Whitsell, F. M. **Surgical treatment of tumors of the optic nerve.** Arch. Ophth. **44**:411-418, Sept., 1950 .

The authors report a case and conclude that one is confronted here with a therapeutic problem which is best handled by cooperation of the ophthalmic and the neurologic surgeon. The neurologic sur-

geon always welcomes the counsel of the ophthalmologist at the time of his exploration of the orbit, whereas the removal of the bulb, should it be necessary, is best executed at a secondary operation by the ophthalmic surgeon.

R. W. Danielson.

Donahue, H. C. **Migrainoid headaches.** Arch. Ophth. **44**:285-292, Aug., 1950.

While studying the typical migraine syndrome, the author came on several interesting entities which simulate migraine to some extent.

1. Histamine headache is generally a unilateral headache, usually beginning in the later decades of life, is of short duration, and frequently comes on at night. It is associated with profuse tearing and congestion of the eye on the same side. There is no associated nausea, vomiting or visual disturbance. Pain is the outstanding complaint; it is constant, excruciating and boring and involves the eye, the temple, the neck, and often the face. Pressure on the external carotid artery on the same side often gives relief. Horton recommends desensitization by repeated small doses of histamine diphosphate. 2. Headaches associated with muscle ischemia is a deep type of pain, not throbbing or sharp, referred to various parts of the head from localized painful areas in the muscles of the head and neck. Williams proposed the following criteria for diagnosis: occurrence after the third decade of life, often following acute infections, and precipitation of symptoms by exposure to physical stimuli. Successful nicotinic acid therapy suggests that muscle ischemia with vasoconstriction is a causative factor. 3. Headache associated with hypoglycemia is a typical hemicrania with, in some instances, a rather characteristic aura, closely resembling that of migraine, which occurs at a period during the day when the blood sugar is at a very low level. 4. Vascular headache may be a syndrome of persistent frontal or orbital pain associated with paralysis or paresis of the third nerve usually occurring in an adult. It suggests aneurysm of the intracranial portion of the carotid artery. Arteriography and surgical treatment are the procedures proposed. Edward J. Swets.

Grant, W. M. **Experimental investigation of paracentesis in the treatment of ocular ammonia burns.** Arch. Ophth. **44**: 399-404, Sept., 1950.

The author concluded that treatment of chemical burns of the eye by repeated paracentesis is not favored by the experimental evidence at present available.

R. W. Danielson.

Landegger, G. P. **A new orbital implant which uses the six extrinsic muscles.** Arch. Ophth. **44**:729-730, Nov., 1950.

A new covered implant which has all six extrinsic muscles attached to it is herewith presented. The advantages of this implant are that it becomes more permanently placed in the center of the orbit and the lower lid stays in its proper position and has no tendency to sag. A motion picture may be borrowed.

R. W. Danielson.

Ogryzlo, M. A., and Graham, W. **Reiter's syndrome: effect of pituitary adrenocorticotropic hormone (ACTH) and cortisone.** J.A.M.A. **144**:1239-1243, Dec. 9, 1950.

The symptom complex of arthritis, urethritis, conjunctivitis and diarrhea (Reiter's syndrome) is of unknown etiology. Treatment has been varied and unsatisfactory. Three patients were injected with pituitary adrenocorticotropic hormone and one of them also received cortisone. All were given placebo injections before and after treatments and did not know of the change in medication. Careful exhaustive observations and study were made to determine the value of such

medication. Promptly after a few days of treatment symptoms disappeared but recurred mildly two days after withdrawal of the drug. This course was essentially the same in all patients and demonstrates a prompt and dramatic reaction to these hormones, and their definite therapeutic value. Claude L. LaRue.

Polte, F. **Subconjunctival injection of air as a new treatment in hemorrhages at the posterior pole of the eye.** Klin. Monatsbl. f. Augenh. **117**:186-191, 1950.

Hemorrhages in the retina were rapidly absorbed after subconjunctival injection of 2 to 7 cc. of air. The author believes that hemorrhages are the consequence of an anoxia of the retinal tissues and that subconjunctivally injected oxygen is the remedy. R. Grunfeld.

Rapisarda, D. **Antistin in external eye disease.** Boll. d'ocul. **29**:361-374, June, 1950.

Patients with 90 different external eye affections were treated with 2 phenyl-benzylaminomethyl-imidazoline (antistine). Favorable effects were recorded in cases of allergic conjunctivitis, chronic conjunctivitis, vernal catarrh, chronic trachomatous pannus and lid eczema. No improvement was noted in acute trachomatous pannus, acute conjunctivitis, and keratohypopyon. The usual local therapy was not omitted. K. W. Ascher.

Rolf, D. E. **Instruments for cataract surgery.** Arch. Ophth. **44**:429-430, Sept., 1950.

The author has devised a small lance which is barb-shaped and has a sharp anterior tip. The inner surface, which is notched, is also razor sharp, and the instrument is used in the following manner. The lance penetrates the cornea to the limbic border and is then rotated vertically to engage the secondary membrane. The small sharp anterior tip perforates this membrane very easily and the instrument is then pulled forward in an inverted V manner. The membrane is caught in the very sharp notch on the inner surface of the lance and is, therefore, dissected very easily as the lance is pulled forward. After the incision has been completed, the lance is again rotated horizontally on its flat surface and extracted from the anterior chamber.

The modified corneal ring, which is also described, was adapted from the standard Verhoeff ring. However, it is stirrup shaped, and the lower border is made concave to conform to the convexity of the lower limbic border of the cornea.

R. W. Danielson.

Rumpf, J. **A modification of Weber's lens loop.** Ophthalmologica **120**:44-45, July-Aug., 1950.

The author reports favorable experiences with a small lens loop of the Weber pattern measuring only 3 mm. in width and length. Peter C. Kronfeld.

Steiger, Max. **A simple tyndallimeter.** Ophthalmologica **120**:109-111, July-Aug., 1950.

This instrument, like the original colloidometer of Roenne (Deutsche Ophth. Gesellschaft 1936), is an accessory to the slitlamp, permitting estimates of the turbidity of the aqueous, by comparing the latter with the turbidity of the cornea.

Peter C. Kronfeld.

de St. Martin, R. **Insufficient radiotherapy in hypophyseal tumors.** Ann. d'ocul. **183**:851-881, Oct., 1950.

Advances in the past several decades have greatly changed the relative values of surgical and radiotherapeutic measures, especially in the treatment of pituitary tumors. Eosinophilic adenomata and other radiosensitive intradural hypophyseal tumors are preferably treated with adequate doses of deep-ray therapy for

four months or more, unless impending blindness necessitates the more rapid surgical treatment. Suprasellar meningiomas, chordomas, Rathke pouch and other less radiosensitive tumors are best treated surgically. In 8 cases observed by the author surgical treatment resulted in two thirds improvement and failures in one third; radiotherapy was followed by improvement in 12 percent, temporary improvement only in 85 percent and by recurrence in 75 percent. The usual symptoms and generally adopted surgical techniques are briefly discussed.

Chas. A. Bahn.

Tower, Paul. **Increased accuracy in squint surgery.** Arch. Ophth. **44**:395-398, Sept., 1950.

An instrument is described, consisting of a right-angled advancement forceps to which a flat, calibrated sliding bar is attached. The exact amount of resection can be measured off on the scale moved beyond the jaws of the forceps. Obstruction of the operative field is avoided, and the new device neither interferes with the correct placing of sutures nor causes damage to the tissues of the muscle stump. R. W. Danielson.

6

OCULAR MOTILITY

Alvaro, M. E. **Simultaneous surgical correction of vertical and horizontal deviations.** Ophthalmologica **120**:191-197, Oct., 1950.

Simultaneous correction of vertical and horizontal deviations is accomplished by reattaching both the recessed and the resected horizontal rectus muscle above or below their original line of insertion. In the former case the anterior pole of the globe is raised, in the latter it is lowered. Since the new insertions of both horizontal muscles are moved the same amount and in the same direction no cyclophoria results. One millimeter of vertical displacement of both muscles corrects approximately one degree of vertical tropia. In 27 patients operated upon in this fashion satisfactory results were obtained.

Peter C. Kronfeld.

Druault-Toufesco, N. **A frequent cause of heterophoria.** Arch. d'opht. **10**:505-506, 1950.

The author calls attention to heterophoria as a cause of dissatisfaction with glasses which adequately correct the refractive error. He states that the absorption of orbital fat which commonly occurs as an aging process results in muscle changes that lead to heterophoria. It is the heterophoria for near vision which is most annoying and vertical errors are more important than horizontal ones. He advocates their correction by the use of decentration or by prisms.

Phillips Thygeson.

Franceschetti, A., and Blum, J. D. **The indications for and the results of the myectomy of the inferior oblique muscle.** Ophthalmologica **120**:93-97, July-Aug., 1950.

During the last 12 years 26 myectomies of the inferior oblique muscle were performed at the eye clinic of the University of Geneva. The operation was considered to be indicated: 1. in cases of congenital alternating hypertropia plus esotropia (in which the muscle primarily involved cannot be determined), 2. in cases of congenital overaction of the inferior oblique with or without signs of paresis of the superior oblique, and 3. in cases of acquired paresis of the superior oblique. In all 26 cases the patients have either been cured or considerably improved as the result of the myectomy of the inferior oblique. The benefit derived from the operation is due to the correction of the hypertropia as well as of the cyclotropia.

Peter C. Kronfeld.

Hartmann, Edward. **At what age is it best to operate strabismus?** Ann. d'ocul. 183:882-888, Oct., 1950.

The present tendency to operate for strabismus at the earliest possible age has both disadvantages and advantages. Among the disadvantages of early operation is the necessity of general anesthesia which aside from its slight risk frequently changes the amount of strabismus centrally or peripherally. With the development of face and ocular muscles, strabismus frequently becomes less. Operations in convergent strabismus may cause divergent strabismus, which is much more difficult to cure. Among the disadvantages of late operations and injection anesthesia is the increased difficulty of tissue differentiation due to orbital edema. Orthoptic treatment is best instituted at the earliest practical time. Binocular single vision becomes more difficult to restore with increasing age. Because of the large number of variables in the causation and treatment of strabismus, each case must be considered individually. If there is a reasonable probability that glasses and orthoptic training will restore binocular single vision, surgical treatment should be delayed. If binocular single vision is impossible and the purpose of surgical treatment is for cosmetic reasons alone, early operation is advisable. Chas. A. Bahn.

Raab, Cornelius. **The practical significance of the phorias.** Ophthalmologica 120:220-236, Oct., 1950.

A rather elementary, but very practical introduction to the subject of heterophoria is presented. Peter C. Kronfeld.

Strazzi, A. **Disturbances of ocular motility in sinusites.** Riv. oto-neuro-oftal. 25:299-315, July-Aug., 1950.

Four cases of paresis of the sixth nerve, one of spasm of the superior oblique muscle and one case of paresis of this muscle, all due to frontal ethmoidal or sphenoidal sinusitis, are reported. Surgical treatment in one and medical treatment in the others was followed by recovery in all cases. The writer emphasizes the importance of X-ray examination in the diagnosis.

Melchior Lombardo.

7

CONJUNCTIVA, CORNEA, SCLERA

Alvarez, Abundio. **Ring abscess of the cornea treated with sulfadiazine and penicillin.** Ophthalmologica 120:206-209, Oct., 1950.

Three days after sustaining an apparently superficial corneal injury the patient presented himself with a ring abscess of the cornea and heavy exudation into the anterior chamber. The culture revealed bacillus subtilis. The patient's anterior chamber was opened and irrigated with penicillin and he was also given sulfadiazine systemically and penicillin subconjunctivally. The infection was rapidly brought under control but the cornea became heavily scarred.

Peter C. Kronfeld.

Amsler, Marc. **The tectonic character of perforating corneal grafts.** Arch. d'ophth. 10:589-592, 1950.

Amsler reports on a study of corneal curvatures after keratoplasty in which the curvature changes were followed postoperatively by keratography with the Placido disc. Photographs of the corneal images before operation and at various post-operative intervals are compared. These show clearly the marked changes which occur in the first few weeks. The author advocates the routine use of this method as an aid in the analysis of the factors determining the final visual result.

Phillips Thygeson.

Capolongo, G. **Interpretation of phlyctenular keratoconjunctivitis encountered**

in infectious diseases. Boll. d'ocul. **29**:441-456, July, 1950.

Phlyctenular keratitis in many instances may be a sign of hypersensitivity to an antigen in the infectious agent of scarlet fever, measles, chicken pox, whooping cough or typhoid fever; it should be considered as a meta-allergic manifestation in patients suffering from tuberculosis or scrophulosis in other parts of the body. Tables show the distribution of conjunctival, corneal and limbal phlyctenules observed in 644 patients with measles, 360 patients with scarlet fever, 183 with chicken pox, 177 with whooping cough, and 490 with typhoid fever. The stage of the general disease and the age of the patient are related to the number of ocular eruptions and a comparison with cutaneous tuberculin reaction is also tabulated. (32 references) K. W. Ascher.

Magnol, F. **Preliminary notes on the treatment of trachoma by chloromycetin.** Arch. d'opht. **10**:636-637, 1950.

The author applied chloromycetin topically twice daily in 45 cases of trachoma. The powder is dusted on the everted tarsal conjunctiva. About one-twentieth of the contents of a 0.25-gram capsule is used. The treatment had very little effect on old chronic trachoma of low activity unless energetic grattage of the follicles was performed in addition. In florid, complicated trachoma, on the other hand, the effect was rapid with rapid cicatrization of corneal ulceration and relief of pain and photophobia. Additional treatment of the orthodox type was required after the disease had become stabilized. In uncomplicated florid trachoma the large follicles disappeared rapidly under chloromycetin treatment but healing was incomplete. Fifteen cases of trachoma treated at onset healed completely in a treatment time of only one week. The author calls attention to the low dosage required in topical treatment in contrast to the high and necessarily more expensive dosage required in oral therapy.

Phillips Thygeson.

Offret, G., and Chauvet, P. **Contribution to the study and treatment of corneal vascularization. III. Pathogenesis.** Arch. d'opht. **10**:480-494, 1950.

The authors continue their discussion and review of the literature on corneal vascularization, this time with reference to pathogenesis. The report opens with a consideration of the physiology of the normal cornea and this is followed by a discussion of the relation of new vessel formation to 1. histamine liberation, 2. tissue asphyxia, 3. ariboflavinosis, and 4. imbibitions and swelling of the corneal parenchyma. The authors conclude that no one factor is responsible for extension of vessels into the cornea, but that several factors may be responsible, acting separately or together. Phillips Thygeson.

Offret, G., and Chauvet, P. **Contribution to the study and treatment of vascularization of the cornea. IV. Therapy.** Arch. d'opht. **10**:593-612, 1950.

This is the fourth and final chapter of an important monograph on corneal vascularization covering all phases of the problem. The therapy of corneal vascularization is considered under the following headings: 1. retrobulbar injections of 45 percent ethyl alcohol; 2. phenolization of the sphenopalatine ganglion; 3. galvanocauterization of vessels at the limbus; 4. deep electrocoagulation under biomicroscopic control; 5. corneal peeling, combined with electrocoagulation, and followed by radiotherapy; 6. radiotherapy alone; 7. peripheral keratectomy followed by total lamellar graft; and 8. vitamin B_1 therapy. The merits of each of these methods of treatment are discussed in detail. Preference is given to electrocoagulation under biomicroscopic control as the most valuable single method. Radio-

therapy is considered useful, particularly when there is recent new vessel formation. The article does not refer to the recent work on cortisone and ACTH as they affect corneal vascularization.

Phillips Thygeson.

Orzalesi, F. **The causes of secondary opacification of the corneal implant.** Boll. d'ocul. **29**:425-440, July, 1950.

It is most probably not nutritional deficiency that is responsible for the clouding of the implanted disc; allergic reaction between the donor's and the host's cornea are more important, and the viability of the host's cornea should be particularly considered. K. W. Ascher.

Robson, J. T. **Cervical sympathectomy in nonsyphilitic interstitial keratitis with vestibuloauditory symptoms.** Arch. Ophth. **44**:243-244, Aug., 1950.

In 1945 Cogan described the syndrome of nonsyphilitic interstitial keratitis and vestibuloauditory symptoms. The syndrome consists of predominantly bilateral chronic keratitis. The vestibuloauditory symptoms are typically severe vertigo, tinnitus, nystagmus and progressive deafness. The course, the absence of a familial history, and the consistently negative serologic reactions are important parts of the syndrome. The author presents the eleventh known case of Cogan's syndrome. Cervical sympathectomy was without benefit. Edward J. Swets.

Stallard, H. B. **Fixation of corneal graft by an acrylic splint.** Brit. M. J. **2**:1034-1035, Nov. 4, 1950.

It is important to fix the corneal graft to prevent tilting and opacification. The author describes a method by means of an acrylic disc splint with four flanges anchored to the cornea. The splint is transparent and permits observation of the graft throughout the entire procedure. He recommends that the graft be cut with a trephine 0.1 mm. less in diameter than the recipient's corneal bed. The graft fits perfectly and does not slip into the anterior chamber. (3 figures)

H. C. Weinberg.

Verrey, Florian. **Congenital keratitis.** Ophthalmologica **120**:4-8, July-Aug., 1950.

The author has followed closely a case of bilateral congenital corneal lesions of the type that may be due to inflammation (internal corneal ulcer, Von Hippel) or due to delayed separation between crystalline lens and corneal endothelium (Peters). In the case under review the family history was essentially negative; pregnancy and delivery had been normal. Shortly after birth the eyes were found to be mildly irritated and the central areas of both corneas were opaque, edematous and bulging slightly. The peripheral rims were almost clear but showed beginning vascularization which gradually progressed toward the center. The anterior chambers were shallow and the irides were probably partly adherent to the corneal lesions. During the subsequent three months the eyes became quiet, the vessels reached the central lesions which had become flatter and densely scarred without signs of active edema. The child reacts to light. The author is considering optical iridectomies.

Peter C. Kronfeld.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Dufour, R., and Bourguin, A. **Heerfordt's disease.** Ophthalmologica **120**:50-56, July-Aug., 1950.

The diagnosis of Heerfordt's disease, that is, uveitis, parotitis, hilar lymphadenopathy and fever, was made in five of the 40,000 new cases seen at the eye clinic of the University of Lausanne during the

last 10 years. In two of these five cases, clinically enlarged lymph glands were excised for biopsy and found to harbor tuberculous granulation tissue.

Peter C. Kronfeld.

Jaensch, P. A. **Metastatic carcinoma of the choroid.** Klin. Monatsbl. f. Augenh. 117:113-119, 1950.

The author suggests that an eyeground examination be made before the breast is amputated for carcinoma. If metastases are present in the eyeground the amputation of the breast is useless, nor should the eye be enucleated, because the metastases are general and death will occur within five to seven months.

With carcinoma of the choroid the patient complains of sudden and great visual disturbances because of central and paracentral scotomas. In the early state multiple, bright, pale yellowish foci are seen as in miliary or disseminated tuberculosis of the choroid. Pigmentation is lacking. The tumor is flat and the growth is rapid and it is usually at the posterior pole of the eye. There may be severe pain in the eye before increase of ocular tension sets in because the tumor may press upon the ciliary nerves. Differential diagnostic points for melanosarcoma are pigment spots in the retina over the tumor, shadow on transillumination, slow growth and nodular or mushroom form of granulation. Very slow growth and macular degeneration suggest angioma of the retina.

R. Grunfeld.

Jent-Peyer, Stefi. **The prognosis in malignant melanoma of the uvea.** Ophthalmologica 120:57-59, July-Aug., 1950.

In a follow-up study of 49 cases of uveal malignant melanoma the mortality rate due to metastasis (after enucleation) was found to be about 50 percent.

Peter C. Kronfeld.

Koff, R., Rome, S., Kasper R., Commons, R., Button, R., and Starr, P. **Subconjunctival injection of cortisone in iritis.** J.A.M.A. 144:1259-1260, Dec. 9, 1950.

Eight of nine patients with acute or recurrent iritis were decidedly improved when treated with cortisone injected subconjunctivally. In three patients with recurrent chronic uveitis, attacks were controlled by one injection but chronic granulomatous uveitis was unaffected. Routine method of injection was used, repeated in 48 to 72 hours if necessary. Most patients had received atropine, fever therapy, salicylates and heat. Pain disappeared within a few hours, likewise the hyperemia and exudate. Fresh adhesions thus far unresponsive to atropine were broken and the pupil widely dilated, though old organized synechiae remained. Only two or at most three injections were required. Leading advantages especially over typhoid vaccine therapy are: no sequelae, no contra-indications, the patient remains ambulatory and continues to work, and more effective results. It excels adrenocorticotropic hormone therapy. Iritis is not cured by cortisone alone but is changed to a low grade subsiding inflammation quite amenable to atropine.

Claude L. LaRue.

Kraupa, E. **Atrophy of the iris.** Ophthalmologica 119:317-318, May, 1950.

Kraupa describes a peculiar form of iris atrophy, resembling somewhat the condition of iridoschisis, in the blind right eye of a 54-year-old man, associated with diffuse healed retinochoroiditis and complete absence of the lens.

Peter C. Kronfeld.

Di Luca, G. **Sympathetic irritation and sympathetic ophthalmitis.** Boll. d'ocul. 29:387-395, June, 1950.

Six case reports prove the rapid disappearance of sympathetic irritation after enucleation of the sympathizing fellow

eye. Three photomicrographs from one of the enucleated eyes show early signs of sympathetic ophthalmia. In the Bologna eye clinic, sympathetic irritation was observed as early as 19 days and as late as 15 years after the injury of the fellow eye. Differential diagnosis between sympathetic irritation and sympathetic ophthalmia can be very difficult. The former may be nothing but the initial stage of real sympathetic ophthalmitis and therefore enucleation should not be postponed.

K. W. Ascher.

Müller, R. W. **The problem "tuberculous iridocyclitis."** Klin. Monatsbl. f. Augenh. 117:157-160, 1950.

Iridocyclitis is a very rare disease in children afflicated with some form of tuberculosis. Only two cases of iridocyclitis were found among 10,000 tuberculous children. The iridocyclitis seen in these children does not give the appearance of tuberculosis. It is believed that focal infection rather than tuberculosis is the causative agent of the iridocyclitis in tuberculous children.

R. Grunfeld.

Pagliarani, N. **Uveo-meningitis syndromes, Harada type, of melitococcic origin.** Riv. oto-neuro-oftal. 25:237-249, July-Aug., 1950.

Bilateral uveitis with retinal detachment and meningeal symptoms in two women is reported. A woman, 62 years of age, was suddenly taken sick with headaches, dizziness, nausea and slightly raised temperature and her vision was rapidly reduced. The pupils, irregularly dilated by adrenalin, revealed large posterior synechiae. The fundus showed papilloretinal edema and retinal detachment in both eyes. Blood culture was positive for melitococcus. Eight months later the patient showed bilateral bulbar atrophy. The other patient, a girl, 13 years old, had slight headaches and fever, both pupils were normal and opacities were present in the vitreous posteriorly. Slight edema of the discs and surrounding retina and retinal detachment were present in both eyes.

Melchior Lombardo.

9

GLAUCOMA AND OCULAR TENSION

Alaerts, L. **The circulation of the blood and of the aqueous humor in chronic ocular hypertension.** Arch. d'opht. 10:613-628, 1950.

Alaerts reviews the theories of etiology of chronic glaucoma with special emphasis on the role played by the state of the vessels in the various levels of the eye. He recalls that 36 years ago Van Lint wrote that he considered the turgescence occurring in the choroid or uvea from any reason whatsoever as leading to a veritable erection of the ocular globe, constituting glaucoma. Alaerts then reviews the anatomy of the ocular vessels and the effect of vasodilatation on ocular hypertension. He notes that normal and glaucomatous eyes react differently to the various provocative tests and that vasodilation may or may not provoke ocular hypertension according to the circumstances of the particular eye concerned. He reports on experimental studies on the circulation of the aqueous in a series of eyes with chronic glaucoma in which the pressure is uncontrolled, and in a second series in which the intraocular pressure has been normalized by operation or treatment. He concludes that ocular hypertension in chronic glaucoma is not due to a greater production of aqueous than the angle is able to eliminate but rather to an augmentation in the volume of the choroid. He states that the important findings in chronic glaucoma are vasodilatation in the uveal tract, absence of stasis of aqueous humor, and changes in capillary permeability.

Phillips Thygeson.

Arkin, Wiktor. **The cause of contraction of the nasal part of visual field in glaucoma.** Klinika Oczna 19:241-246, 1949.

Contraction of the visual field is ascribed to a disturbance in circulation by Riedl and Arlt but by the author to pressure on the temporal nerve fibers. The nerve fibers are spread more thinly on the temporal side of the disc, are less resistant to pressure and, because of the obliquity of the canal, the pressure is also more effective on the temporal side than on the nasal. Sylvan Brandon.

Goldmann, H. **The site of the increased resistance to filtration in simple glaucoma.** Ophthalmologica 119:267-280, May, 1950.

In reply to Gába's criticism (Ophthalmologica 119:262, 1950) and to Ascher's concept of a narrowing of the outlets of Schlemm's canal in certain types of glaucoma (Arch. Ophth. 42:66, 1949) Goldmann restates his views on the pressure relationships in the anterior drainage channels of the human eye. To review the situation briefly, Goldmann had defined the apparent outflow pressure as the amount of spring pressure that must be applied to the center of the cornea (by means of an ophthalmodynamometer) to bring on a visible enlargement of an aqueous vein of medium caliber. In a representative series of cases the outflow pressure in eyes affected with chronic glaucoma had been found significantly higher than in normal eyes. The common occurrence of a negative glassrod phenomenon in chronic glaucoma had been reported by a number of observers. Goldmann interpreted the high outflow pressure as a sign of unusual resistance to flow and the negative glassrod phenomenon as a sign of a low pressure in the canal of Schlemm. Combining the two sets of observations Goldmann arrived at the theory that the resistance to filtration in chronic glaucoma is between the anterior chamber and the canal of Schlemm (Ophthalmologica 116:195, 1948).

Gába criticized this theory on the ground that a negative glassrod phenomenon only indicates that at the particular moment of measurement the pressure in the canal of Schlemm is slightly lower than the pressure in that part of the episcleral venous system with which the aqueous vein in question communicates. No conclusions, argues Gába, concerning the absolute pressure level in the canal of Schlemm can be drawn from a negative glassrod phenomenon without having measured the pressure in the episcleral veins at the same time. Since that pressure is presumably very variable and dependent upon the caliber of the vein, Goldmann's conclusion of an absolutely low pressure in the canal of Schlemm of glaucomatous eyes is unfounded.

Goldmann now replies that the outflow pressure, by definition and by its method of measurement, is the drop in pressure occurring between the anterior chamber (the intraocular pressure) and the episcleral veins. Since a rise in venous pressure promptly causes the intraocular pressure to rise, the outflow pressure as such is independent of the venous pressure. Therefore Goldmann reasons that if in a given case and for a given aqueous vein the glassrod phenomenon is negative and the outflow pressure high, the resistance must be located between anterior chamber and canal of Schlemm. In support of his view he quotes the new findings of Linner, Rickenbach and Werner who by actual measurement found the pressure in the aqueous veins and in the communicating blood veins of the same magnitude.

Goldmann's procedure of selecting aqueous veins of certain width for the measurement of the outflow pressure was criticized by Ascher. Goldmann admits the marked dependence of the results upon the width of the aqueous veins used

for the measurement, but in order to obtain comparable data on normal and glaucomatous eyes aqueous veins of equal width must be used. Finally Goldmann reports measurements of the pressure in the aqueous vein in normal and glaucomatous eyes at various points in their episcleral course. That pressure is practically the same in glaucomatous and in normal eyes and only very slightly higher at the point of emergence of the vein from the sclera. The latter pressure should come very close to that prevailing in the canal of Schlemm. These measurements would seem to indicate that most of the pressure drop between anterior chamber and episcleral veins occurs in the corneoscleral trabeculum. Peter C. Kronfeld.

Grant, W. M. **Tonographic method for measuring the facility and rate of aqueous flow in human eyes.** Arch. Ophth. **44**: 204-214, Aug., 1950.

The method described, using an amplified electronic Schiøtz tonometer and recording galvanometer, was devised in order to obtain recorded tonographic readings and data for the measurement of the patency of aqueous humor channel outflow and the steady state net rate of aqueous flow. In 34 human eyes the net rate of aqueous humor formation averaged 3.66 cu. mm. per minute. The method will next be used to obtain data on the mechanisms of glaucoma.

Edward J. Swets.

De Grósz, Stephen. **Data concerning the pathogenesis of primary glaucoma.** Ophthalmologica **119**:281-284, May, 1950.

The cholinesterase activity of the aqueous obtained from glaucomatous and non-glaucomatous human eyes was determined chemically. It was found to vary within wide limits, with possibly higher values in the glaucomatous eyes, which would fit in with Bloomfield's findings of low acetylcholine production in glaucomatous eyes (Arch. Ophth. 37:608, 1947). Peter C. Kronfeld.

Magitot, A. **The basis of the neuropsychiatric treatment of glaucoma.** Ann. d'ocul. **183**:817-828, Oct., 1950.

Progressive degenerative neurovascular disease exists in nearly all primary glaucoma not only in the eyes but throughout the body. The fate of the affected eye frequently depends on the neurovascular involvement. Parasympathetic insufficiency, predominant prevenous capillary involvement, and tendency to spastic reactions are among its earlier symptoms. Later the usual sclerotic changes dominate the clinical picture. As in most neurovascular diseases all parts of the body and of the eye are not equally predisposed or affected and the associated central involvement which is principally located in the thalamic region materially affects the progress of the disease. In glaucoma the attacks and exacerbations frequently follow emotional upsets and strains. If the uveal circulation is predominantly involved intraocular hypertension will probably be coexistent. If the circulation of retina and optic nerve alone are involved, the characteristic excavation and pallor of the disc with typical pericentral, peripheral and central visual deterioration will develop and progress but ocular tension will remain practically normal. Blockage of the filtration angle is usually a secondary and often a minor factor in the progress of acute, subacute and chronic primary glaucoma. In the neuropsychiatric treatment of glaucoma the following factors must be considered. Especially in the preglaucomatous stage, patients must be made to realize that their future sight in no small degree depends on the emotional conflict or strain with which they meet the problems of their lives. The intelligent use of barbiturates frequently aids in reducing their thalamic hypersensitivity. All operative

procedures may normalize ocular hypertension but they do not cure glaucoma. Retrobulbar injections of alcohol or even procaine alone frequently accomplishes the same results. No surgical procedure can cure the coexistent intraocular neurovascular degenerative disease. The risks associated with glaucoma surgery usually parallel the neurovascular degeneration. Many blind glaucoma patients would have retained some sight, often for a long time, had some ophthalmic surgeon realized that surgical trauma to eyes with badly diseased vessels often can only hasten total blindness. In advanced primary glaucoma particularly, the fate of the eye usually depends more on the associated vascular disease than on increased ocular tension.

Chas. A. Bahn.

Rickenbach, K., and Werner, H. **The relationship between the apparent outflow pressure, the ocular tension and the pressure in the aqueous veins.** Ophthalmologica **120**:22-27, July-Aug., 1950.

Goldmann defined the apparent outflow pressure as the amount of external pressure that has to be applied to the eye (by means of a dynamometer placed on the cornea) to cause a visible widening of an aqueous vein. The results obtained with this method were considered to represent rough measurements of the resistance to aqueous flow encountered between the anterior chamber and the episcleral veins. In a large series of measurements an almost linear relationship between ocular tension and apparent outflow pressure was obtained for ocular tensions above 19 mm. Schiøtz. For tensions below 19 no definite correlation existed. Theoretically a close relationship between ocular tension and outflow pressure was to be expected. To investigate the matter further, Rickenbach and Werner proceeded to measure the pressure in the aqueous veins directly by means of a microtorsion balance placed directly against the conjunctiva overlying or surrounding a laminated vein. Such measurements on 78 eyes with ocular tensions varying from 10 to 49 mm. Schiøtz, yielded an average of 11.3 ± 2.16 mm. Hg, with a slight tendency toward lower aqueous vein pressures in eyes with higher ocular tension. This means that in eyes with chronic glaucoma the pressure in laminated veins is the same or slightly lower than in normal eyes. The authors propose that the difference between the ocular tension and the pressure in the laminated veins be considered to represent the true outflow pressure.

Peter C. Kronfeld.

Rintelen, F., and Smolik, H. **The effect of hydergin upon the intraocular and the diastolic retinal arterial pressure.** Ophthalmologica **120**:100-103, July-Aug., 1950.

Improvement of the retinal blood flow should be one of the aims of glaucoma therapy. Theoretically this could be accomplished with a drug that dilates the retinal arterioles without raising the intraocular pressure. Hydergin, a mixture of ergot alkaloids with sympatholytic action, seemed suitable, a priori, for the purpose of improving the retinal blood flow. Clinical trials have, so far, failed to yield unequivocal results. The work is being continued. Peter C. Kronfeld.

Scheie, H. G., and Frayer, W. **Ocular hypertension induced by air in the anterior chamber.** Arch. Ophth. **44**:691-702, Nov., 1950.

The observations presented here seem to offer sufficient proof that pronounced elevations in ocular tension may result from the injection of air into the anterior chamber. The air need be injected only under very low pressures, in the range of 10 mm. Hg or even less, to produce the phenomenon. The rise in tension is

almost certainly due to obstruction of the flow of aqueous from the posterior to the anterior chamber as a result of a valve-like action between the posterior surface of the air and the anterior surface of the iris. The fact that injection of air can precipitate acute increases of ocular tension seems of considerable clinical importance in view of the increasing use of air after operation. Certainly, one should be very hesitant in placing any but small amounts of air into a tightly sealed anterior chamber, such as that which follows a cyclodialysis, a paracentesis or a goniotomy. The present experiments suggest that if air is used the pupil should be dilated widely. If air is used for hemostatic purposes, after cyclodialysis, probably all but a very small amount should be released, once the bleeding is under control. R. W. Danielson.

10

CRYSTALLINE LENS

Davis, F. A. **Incision and closure of the wound in cataract operations.** Arch. Ophth. **44**:175-197, Aug., 1950.

A statistical comparison is presented of the keratome-scissors incision in 257 operations for cataract and the Graefe knife incision in 202. Deep corneo-scleral sutures were used in both. The author describes in detail the complications in each method. Although the knife-scissors method is allegedly simpler in performance, the wound is often far from perfect when compared to a well performed knife incision. The knife-scissors wound may offer a useful advantage in cases with a very shallow anterior chamber, but the complications arising with the method have led the author to abandon it as a routine procedure. The trauma caused by extensive use of scissors is the main contributing factor in delayed wound closure, subsequent leakage, and possibly in the formation of late extensive choroidal detachment. A deep corneo-scleral suture with either catgut or silk is preferable to the corneo-episcleral suture. The author prefers a single silk suture inserted as a modified McLean type. Healing after knife incision was smoother and more rapid and was followed by fewer postoperative complications, especially hemorrhage into the anterior chamber, iridocyclitis, delayed restoration and late loss of the chamber, incomplete wound closure, choroidal separation, and secondary glaucoma.

Edward J. Swets.

Goldmann, H., Koenig, H., and Maeder, F. **The permeability of the crystalline lens for infrared rays.** Ophthalmologica **120**:198-205, Oct., 1950.

By means of an exact photometric method Goldmann and his associates demonstrate conclusively that the crystalline lenses of rabbits, cattle and man absorb less infrared than water. These results speak strongly against Vogt's theory that glassblowers' cataracts are due to a specific injurious effect of infrared radiation. Peter C. Kronfeld.

Heinsius, E., and Götze, R. **The general treatment of diabetics during hospitalization for cataract operations.** Klin. Monatsbl. f. Augenh. **117**:270-274, 1950.

The routine diabetic diet prescribed, and the management of the diabetic patient before and after cataract operation, are described in detail. R. Grunfeld.

Jancke, Gerhard. **Cataracta syndermatotica and ichthyosis congenita.** Klin. Monatsbl. f. Augenh. **117**:286-290, 1950.

An 8-year-old child whose mother had ichthyosis congenita had complicated cataract and a normal skin. The mother and two members of another family had ichthyosis congenita and cuneiform lens opacities. The possibility of a hereditary connection between lens opacities and ichthyosis congenita is considered.

R. Grunfeld.

Lee, J. B., and Benedict, W. L. **Hereditary nuclear cataract.** Arch. Ophth. **44**: 643-650, Nov., 1950.

A new pedigree of hereditary nuclear cataract is presented. Of 200 members, in 6 generations, 63 were affected, 129 were unaffected, and the condition of 8 was unknown. Of these persons 105 were examined personally; 42 exhibited the cataract and 63 had normal eyes. Information about the 95 members not examined was obtained from close relatives and was usually confirmed by others. This cataract was first described in 1906 by Nettleship and Ogilvie and it has subsequently been termed by other observers "the Coppock cataract," "Doyne's discoid cataract" and "central pulverulent cataract." It is strictly a dominant hereditary characteristic, and it is not sex linked. It is probable that the cataract involves only the fetal nucleus, and that the embryonic nucleus is primarily not affected. The cataract does not reach its final stage of development and become stationary until about the age of 2 years. R. W. Danielson.

Lee, O. S., and Weih, J. E. **Results of operation for cataract with primary glaucoma.** Arch. Ophth. **44**:275-284, Aug., 1950.

The management of patients with senile cataract and primary glaucoma is a major ophthalmologic problem. Several authors have reported satisfactory control of primary glaucoma after cataract extraction alone. The authors analyzed operative procedures in 100 cases of cataract and glaucoma. In cases of chronic noncongestive glaucoma controlled by miotics, regardless of the original pressure height, a combined cataract extraction should be the initial operation. If the tension is not higher than 35 mm. Hg a cataract operation is indicated and the extraction may be done without first attempting to control the tension. If the tension is not controlled by miotics but a cataract extraction is indicated, a filtering operation combined with a cataract extraction gave better results in this series than a combined cataract extraction alone. It is desirable to use the intracapsular technique in all cases of cataract extraction with primary glaucoma. Edward J. Swets.

Linnen, H. J. **The occurrence of expulsive hemorrhage in cataract operations.** Klin. Monatsbl. f. Augenh. **117**:275-286, 1950.

Among 1,356 cataract extractions expulsive hemorrhage occurred nine times. Four patients were operated on bilaterally within a short period but the hemorrhage appeared in one eye only. The immediate cause may be a vasostimulus, probably of sympathetic nature, which causes a sudden congestion in the retinal and choroidal vessels. Meticulous examinations before the operation never revealed impending hemorrhage. Neither did long continued treatment of a lung or cardiovascular disease, or treatment of glaucoma prevent the occurrence of hemorrhage, nor were the preoperative use of sedatives or venesection of any value. Patients with high blood pressure, glaucoma, high myopia, and senescence are predisposed to expulsive hemorrhages. Among the nine patients with expulsive hemorrhage five had corneal scars and many had brunescent cataracts.

R. Grunfeld.

Pau, Hans. **Etiologic consideration of coronary cataracts (Vogt).** Klin. Monatsbl. f. Augenh. **117**:290-295, 1950.

The author finds a striking resemblance between traumatic coronary cataract and therefore believes that the coronary cataract belongs to the group of traumatic cataract. In one case in which only one eye was affected the other eye which was free of opacities had paresis of accommodation. The author concludes that the

pull of the zonula is the cause of the cataractous changes. The zonular pull causes a circumscribed disturbance of metabolism and permeability changes of the lens capsule in certain constitutionally disposed persons. In another case the lens opacities were absent in the region of a coloboma of the iris where there were no zonular fibers. R. Grunfeld.

Roggenkämper, Walter. **Securing the cataract incision wound by suture.** Klin. Monatsbl. f. Augenh. 117:191-198, 1950.

A bridle suture is placed through the tendon of the superior rectus muscle for guidance. For the corneal suture the author uses woman's hair. One end of the suture is armed with a corneal, the other end with conjunctival needle. Before the incision is made the corneal needle is inserted in the superior layer of the cornea parallel to the limbus and 1 mm. below it exactly under the tendon of the superior rectus muscle. Then the needle is carried through the tendon of the superior rectus muscle through the intact conjunctiva. Thereafter the conjunctival needle is carried through the tendon from the opposite side. The sutures are held apart for the incision and after the cataract extraction they are tied, but not so tightly that the wound edges overlap. If special complications are feared, as for instance in high myopia, the author prepares a conjunctival flap and carries the sutures to the tendon under the undermined flap. R. Grunfeld.

Tower, Paul. **A forceps for corneoscleral sutures.** Arch. Ophth. 44:731-732, Nov., 1950.

In cataract extraction, placement of the corneoscleral sutures can be hastened and facilitated by slightly modifying the instrument ordinarily employed. Frequently the Burch pick is used; this ophthalmostat is provided with two fine and sharp points, as well as with stops near the tips, to prevent excessive penetration of episcleral tissue. R. W. Danielson.

Werner, H. **Biomicroscopic studies of the insertion of the posterior zonula fibers.** Ophthalmologica 120:47-49, July-Aug., 1950.

The equator of the lens can be visualized in situ by means of Goldmann's new contact lens with three built-in mirrors (Ophthalmologica 117:253, 1949). In the deepest portion of the hyalocapsular recess the zonula fibers can be seen to extend toward a reflex line on the posterior lens surface. Close examination of this area shows a slight angular deformation of the lens surface, produced, apparently, by the pull of the zonula fibers. Peter C. Kronfeld.

11

RETINA AND VITREOUS

De Barros, E. C. **A case of recurrent vitreous hemorrhages treated with streptomycin.** Ophthalmologica 119:315-317, May, 1950.

The report concerns a case of Eales' disease in which some benefit may have followed the intramuscular administration of streptomycin (1 gram daily for about three months). Peter C. Kronfeld.

Bullerschen, Heinz. **Two cases of venous aneurysms of the retina in diabetic retinitis.** Klin. Monatsbl. f. Augenh. 117: 265-269, 1950.

Two cases of severe diabetic retinitis are described in which multiple aneurysms of the venules were clearly seen as such with the Gullstrand ophthalmoscope. Both patients had diabetes for several years and their bloodsugar level varied between 150 and 290 mg. percent. The author describes Friedenwald's method of staining all tissues containing carbohydrate red with Hotchkiss' technique. This staining method revealed that

every venule has a membrane containing carbohydrate below the endothelium. When the blood sugar level stays high for a long time, this membrane becomes thickened and damaged by nutritional disturbances leading eventually to aneurysm. R. Grunfeld.

Cohen, I. J., and Weisberg, H. K. **Vertical heterotopia of the macula.** Arch. Ophth. **44**:419-423, Sept., 1950.

In all previously reported cases of heterotopia of the macula, whether believed to be on a developmental basis or due to congenital noxious influences, such as hereditary syphilis, lesions of the fundus such as chorioretinitis or pigment changes similar to those seen with retinitis pigmentosa have been present. In the majority of instances traction bands could be demonstrated. A case has been noted in which heterotopia maculae followed operation for retinal detachment with ignipuncture, and in another it was due to macular hemorrhage during delivery.

In the case presented the displacement can best be explained as due to abnormal differences in the rates of growth and maturation of the portions of the retina involved. R. W. Danielson.

Diener, Fritz. **The question of retinitis juxta papillaris (E. Jensen).** Klin. Monatsbl. f. Augenh. 117:141-156, 1950.

The author describes four cases of retinitis juxta papillaris with cotton-wool exudates and a sector-shaped, nerve-fiber bundle defect in the visual field. This clearly indicates that the disease affects primarily the nerve fiber layer of the retina and is not a choroiditis. The author's fifth case showed clearly the close relation of the optic nerve to this disease, for there was a neuritis associated with retinitis in its vicinity. The author also describes three cases of choroiditis near the papilla. In none of them was the characteristic sector-shaped defect present. R. Grunfeld.

Fuchs, Johannes. **Visible bloodflow in the retinal veins in thromboangiitis obliterans.** Klin. Monatsbl. f. Augenh. 117: 253-265, 1950.

The author describes a case with visible bloodflow in the retinal veins. The cause of this phenomenon is considered to be a vascular disease akin to thromboangiitis obliterans. As a result of the vascular disease and vasospasm, the blood circulation is slowed and the blood flow in the veins becomes visible. The blood circulation and the vision could be improved with parasympathetic stimulants and by repeated anesthesia of the stellate ganglion. R. Grunfeld.

Fulton, Harold. **A roentgenographic aid in the diagnosis of retinoblastoma.** Am. J. Roent. **64**:735-739, Nov., 1950.

Retinoblastoma, the commonest form of retinal glioma, requires early diagnosis if the child's life is to be saved. Metastasis is rare but rapid extraocular extension is universal. As the tumor cells degenerate, calcium is deposited, even early, thus affording through X-ray study an almost universally positive diagnostic aid. Of four cases studied preoperatively, and reported, three showed definite areas of calcification. Certain congenital and inflammatory conditions, retinal detachment and angiomatosis, also cysticercus, all grouped as "pseudoglioma," render diagnosis difficult. Color of the commonly found light reflex and appearance of the mass itself are inadequate criteria. Granular irregular calcification in the infant orbit is pathognomonic, and is demonstrated in about 75 percent of cases by roentgenograms. Claude L. LaRue.

Heath, Parker. **Retrolental fibroplasia as a syndrome.** Arch. Ophth. **44**:245-274, Aug., 1950.

The author summarizes the variety of opinion expressed by many investigators with regard to retrolental fibroplasia and attempts to correlate microscopic and clinical material into an organized syndrome. A detailed microscopic analysis is presented and the author concludes that retrolental fibroplasia is a rare proliferative fibrous reaction primary in the lens and its fossa; it is also a secondary angiofibrous manifestation of retinal disease. These processes are sporadically found in full term infants, children and juveniles. In addition, a similar fibrosis can be an incidental reparative reaction to ocular injury at any age. Retrolental fibroplasia also commonly occurs in prematurely born infants of low birth weight as a secondary manifestation of primary retinal disease. The primary disease is an edematous, hemorrhagic and proliferative process associated with hamartomatous neovascular tissue in the retina, a process best described as the retinopathy of premature birth.

The earliest clinical signs of the retinopathy of prematurity are engorged vessels, edema and occasional hemorrhage in the retina. Later elevations of the retina are accompanied by loss of transparency. The primary retinal lesion may become stationary. It is reversible in inverse proportion to involvement of the vitreous. The secondary manifestations seen in the vitreous are a haze, a dotlike opacity, fibrillae, strands and bands. The second stage begins with involvement of the vitreous. The vitreous becomes organized and pulls the retina off axially and forward until it lies behind the lens, where a fibrovascular membrane develops. A dentate fibrosis can now be seen behind the lens. In the late stages, the anterior chamber becomes shallow. Glaucoma may develop.

It is possible that the retinal disease of prematurity becomes clinically manifest only because of a complicated nutritional imblance induced in the environment. No material causes are known. Whether preventive treatment should be predominantly on the maternal or on the infant side remains to be discovered. When the retinal disease of prematurity has progressed to the second stage and shows considerable retinal separation, only symptomatic treatment is indicated.

Edward J. Swets.

Heath, Parker. **Massive separation of the retina in full term infants and juveniles.** J.A.M.A. **144**:1148-1154, Dec. 2, 1950.

Classification of massive retinal separations in full term infants and juveniles is greatly simplified by grouping as follows. Group 1. Retinal aplasia and dysplasia, i.e., congenital developmental anomalies like incompleteness of retinal structure and insufficient secondary vitreous to afford approximation against the choroid. Group 2. The inflammations, usually uveitis and endophthalmitis of known cause, often meningococcic meningitis. Less frequent causes are parasites and mycotic infections. With these the retina is frequently forced apart by edema and hemorrhage rather than pulled by organized vitreous exudate. Group 3. The nonspecific vascular retinopathies and rare multiple cysts, allergic conditions and nutritional deficiencies, as well as separations that are little understood. Group 4. The primary retinal neoplasms of which there are three main types. Retinoblastoma, the commonest, occurs usually in one eye only, at the age of six months to three years, grows and degenerates rapidly. Angiomatosis (von Hippel's disease) produces early retinal elevation in one quadrant, exudation and hemorrhage. Vasoformative tissue with nodular swellings and proliferations next appears and finally but gradually the massive separation. Astrocytoma (true glioma) occurs between four

to six years of age or even in young adults, resembles retinoblastoma, and is very rare. Diagnosis is difficult even with adequate classification and in massive separation much is yet undetermined as to etiology. Claude L. LaRue.

Mortelmans, L. **Familial degeneration of the macula.** Ophthalmologica **120**:157-167, Sept., 1950.

The report concerns the occurrence of a progressive bilateral degenerative disease of the macula in three brothers of a family of eleven siblings. The first subjective symptoms of the eye disease were noticed one to two years after a severe head injury. The author considers the injury as the second pathogenic factor, heredity being the first.

Peter C. Kronfeld.

Schepens, C. L., and Bahn, G. C. **Examination of the ora serrata.** Arch. Ophth. **44**:677-690, Nov., 1950.

Under the ophthalmoscope, the ora serrata appears as a serrated, pigmented line. The nasal serrations differ in appearance from the temporal ones. An early pathologic change is the backward displacement of one of the bays of the ora. This may be the earliest form of retinal dialysis. Experiments performed on patients and on enucleated eyes proved that for the examination of the extreme periphery of the fundus indirect ophthalmoscopy is definitely superior to the direct method. The main obstacle with use of a direct ophthalmoscope is the greater magnification which blurs the image of the periphery. Stereoscopic indirect ophthalmoscopy, with a strong light source and a plus 20.00 D. condensing lens, seems to be the most effective method.

In cases of detachment associated with aphakia, two types of retinal breaks have often been observed near the ora serrata: small dialyses, and retinal breaks related to meridional retinal folds. The cause of the meridional folds is uncertain. The changes described have also been observed in some phakic patients with detachment. It seems, therefore, that uncomplicated extraction of the lens is not an important cause of the type of detachment under consideration.

R. W. Danielson.

12

OPTIC NERVE AND CHIASM

Leinfelder, P. J. **Choked disc and other types of edema of the nerve head; comment on the physiopathologic features.** J.A.M.A. **144**:919-921, Nov. 11, 1950.

The mechanism of papilledema due to inflammatory disease, to metabolic defects, to intoxications and to congestion with increased intracranial pressure is not clearly understood. Swelling and congestion is usually limited to the disc but if the retina also is involved a general metabolic process exists. Hyperemia and increased capillary tension produce edema, then impede venous return with resultant anoxia and embarrassed metabolism. Choked disc, common in increased intracranial pressure with impeded central retinal vein function, is not caused absolutely by the venous obstruction but is probably caused by obstruction of disc capillaries. Certain poisons like quinine constrict arterioles and deprive the nerve head of oxygen and metabolites. Perhaps the essential cause of papilledema is congestion of nerve head capillaries which receive their blood supply from the choroidal circulation through the circle of Zinn, and empty, in part at least, through the posterior ciliary veins. Consideration of different routes of venous drainage certainly helps clear up many discrepancies of theory as to the cause of papilledema.

Claude L. LaRue.

13
NEURO-OPHTHALMOLOGY

Alajmo, Arnaldo. **Pupillometry in patients with Argyll Robertson signs.** Giorn. ital. oftal. 3:264-272; July-Aug., 1950.

Variations of the pupil in near vision in patients with Argyll Robertson pupil were measured by means of a Lobeck pupillometer. Two of the subjects had the pupillary defect in one eye only.

Vito LaRocca.

Forsius, Henrik. **Generalized herpes zoster with eye complications.** Ophthalmologica 119:285-291, May, 1950.

Two cases of herpes zoster are reported in which the disease started typically in the ophthalmic region and was followed, a few days later, by a generalized vesicular rash. In two other cases of severe ophthalmic herpes a few vesicular lesions were found outside the originally affected trigeminal area. The outstanding ocular manifestations of the disease were severe lid involvement, blisters on the palpebral conjunctiva and acute iritis with secondary glaucoma. The author believes generalized herpes zoster to be a severe form of herpes zoster, unrelated to chicken pox.

Peter C. Kronfeld.

Jaffe, N. S. **Localization of lesions causing Horner's syndrome.** Arch. Ophth. 44: 710-728, Nov., 1950.

A system of localizing lesions which produce Horner's syndrome is presented. Localization may be accomplished by two methods: 1. tests which determine the level of the sympathetic lesion, among which are the reactions of the pupil to cocaine, epinephrine, homatropine, atropine and a psychosensory stimulus, and 2. evaluation of signs and symptoms attributed to involvement of neighboring structures. There is frequently a symptom complex associated with the Horner syndrome at each level of interruption of the sympathetic chain. Cases of the following lesions associated with Horner's syndrome are presented to illustrate the method: 1. paratrigeminal syndrome. 2. syndrome of the posterior inferior cerebellar artery. 3. calcified substernal adenoma of the thyroid gland, and 4. syphilitic aneurysm of the aorta.

This article is so full of important details that it should be read by all neuro-ophthalmologists. One of many interesting remarks is that the author has never observed enophthalmos due to sympathetic interruption in man.

R. W. Danielson.

Lowenstein, O., and Loewenfeld, I. E. **Mutual role of sympathetic and parasympathetic shaping of the pupillary reflex to light: pupillographic studies.** Arch. Neurol. and Psychiat. 64:341-378, Sept., 1950.

By means of pupillographic experiments on monkeys, cats and rabbits, a certain relationship was discovered in the dynamic sympathetic-parasympathetic equilibrium which is a prerequisite for the production of optimal autonomous reflex activity. Deviations from the optimal sympathetic-parasympathetic relation, in favor of either factor, disinhibit or inhibit autonomous reflex activity and, under extreme conditions, abolish it. This includes such parasympathetic reflexes as the pupillary reflex to light, and such sympathetic reflexes as the psychosensory dilatation reflex, and is in agreement with previously published results of experiments on man. In all species used the pupillary reflex to light consists of the same elements. The contraction movement has at least two phases, a fast, primary, and a slower, secondary, phase. Redilation also occurs in two phases, a faster, primary, and a slower, secondary, phase.

Differential analysis of the pupillographic curve of the reflex to light shows,

in general, three waves of increasing and decreasing speed of motion: a contraction wave (C wave), a primary redilation wave (D wave) and a secondary redilation wave (E wave). The ascending branch and peak of the C wave correspond to the primary contraction, the descending branch to the secondary contraction. The D wave corresponds to the primary redilation phase, and the E wave to the secondary redilation phase. The ascending branch and peak of the C wave are primarily the result of parasympathetic activity, the descending branch of the C wave parasympathetic reflex activity, damped by increasing antagonistic sympathetic influence, predominantly central, but also peripheral. The D wave is predominantly the result of parasympathetic relaxation, and the E wave depends mainly on impulses running over the peripheral sympathetic pathways. All varieties of reflex patterns are reflected in the differential curves as quantitative differences of the height, length and positions on the time axis of the C, D and E waves. A number of stable relations characteristic of the different species examined exist and are described.

The dynamic structure of the pupillary reflex to light depends on the strength, duration and timing of coinciding sympathetic and parasympathetic impulses. The parasympathetic factor is essential for the light reflex pattern to become manifest, the sympathetic factor determines its shape. The various reaction patterns conditioned by irritation or lesions at various levels of sympathetic or parasympathetic control are frequently accompanied by various types of anisocoria, the symptoms and genesis of which are described in detail. All pupillographic syndromes produced by experimental lesions in animals are observed in man as clinical manifestations of pathologic processes in corresponding sites.

Theodore M. Shapira.

Pau, Hans. **Keratitis neuroparalytica without participation by the trigeminus.** Klin. Monatsbl. f. Augenh. **117**:174-177, 1950.

Three cases of keratitis neuroparalytica are described presumably caused by irritation of the trophic sympathetic nerve fibers. The trigeminal nerve was not visibly affected. A similar disease picture originated from chronic irritation of imbedded foreign bodies in the cornea. The author believes that the trigeminal nerve plays no role in the etiology of keratitis neuroparalytica. R. Grunfeld.

Rucker, C. W. **Neuro-ophthalmology.** Arch. Ophth. **44**:733-743, Nov., 1950.

"Let the interested reader consult it himself, for he will find it concisely written and full of information" is written by Rucker about an article by King and Walsh, but the remark applies to Rucker's own review also. R. W. Danielson.

14

EYEBALL, ORBIT, SINUSES

Fralick, F. B. **The orbit.** Arch. Ophth. **44**:437-453, Sept., 1950.

This review is so compact and well done that further abstracting would be difficult. It should be read in its entirety by every ophthalmologist.

R. W. Danielson.

Heinsius, Ernst. **Metastatic ophthalmia through blastomycosis.** Klin. Monatsbl. f. Augenh. **117**:136-141, 1950.

A 52-year-old baker was admitted to the hospital with meningeal symptoms. Neurologic examination disclosed symptoms of brain tumor. In both eyes numerous, floating vitreous opacities were seen. The retina was edematous and detached in several places. A number of hemorrhages and disseminated retinochoroiditic spots were noted. Before the papilla a greenish white sharply delimited tumor protruded

into the vitreous. In the inguinal and supraclavicular regions enlarged and swollen lymphglands were palpated. Biopsy led to the diagnosis of blastomycosis. Histologic examination of the brain showed blastomycotic infiltration of the leptomeninges and cranial vessels. Examination of the eyes revealed that both nerve sheaths were filled with yeast masses. On the papilla a tumor-like conglomeration of yeast cells was found. The yeast cells extended between the choroid and the retina. The retina was detached in places and was infiltrated with nodules of yeast cells. In the inner layers of the retina around the vessels phagocytic reaction took place.

The distribution of the isolated, disseminated fungus masses pointed to a hematogenic origin. The yeast fungus lives as a harmless saprophyte in the conjunctival cul-de-sac and as a pathologic agent on the eyelids. It becomes pathogenic for the eyeball only if this organ becomes weakened. When yeast accumulates on the exterior it produces a toxin which enters and damages the interior of the eye and creates a locus minoris resistentiae where the fungus is able to settle and grow. R. Grunfeld.

Linnen, H. J. **Bilateral metastatic ophthalmia in a 7-day-old infant as the consequence of an intrauterine infection.** Klin. Monatsbl. f. Augenh. 117:120-127, 1950.

The author describes a bilateral metastatic ophthalmia in a child seven days old. The ophthalmia originated from an intrauterine infection which also led to osteomyelitis in the right tibia. The child died the following day. A histologic description of the eyeballs is given.

R. Grunfeld.

Melanowski, W. H. **Surgery on the orbit based on personal experience.** Klinika Oczna 19:169-199, 1949.

Purulent cellulitis of the orbit as a complication of scarlet fever was treated by a wide incision to avoid optic atrophy. Cases of mucocele and osteoma are described and discussed. Five cases of tumor of the lacrimal gland and 15 of tumor of the optic nerve are presented. In 15 cases of cavernous hemangioma of the orbit the neoplasm was removed by orbitotomy according to the method of Golowin-Rollet. The procedure is compared with that of Krönlein. (39 figures)

Sylvan Brandon.

Nover, Arno. **Bilateral metastatic ophthalmia through fungus emboli.** Klin. Monatsbl. f. Augenh. 117:127-135, 1950.

In the course of a lethal endocarditis both eyes became infected by fungus resulting in iridocyclitis, posterior synechia, complicated cataract and vitreous abscess. The eyeballs were intact. The infection must have originated by metastatic emboli through the central retinal arteries. The infections were severest around the retinal capillaries while the uveae were only secondarily and less severely affected. R. Grunfeld.

15

EYELIDS, LACRIMAL APPARATUS

Friede, Reinhard. **Operation for epicanthus.** Klin. Monatsbl. f. Augenh. 117: 178-186, 1950.

There are physiologic and pathologic forms of epicanthus. The latter is accompanied by congenital lid changes and universal dysplasia. The physiological epicanthus does not need treatment for it disappears with time. The pathologic epicanthus responds to surgical treatment, which consists of excision of skin, displacement of the subcutis and implantation of cartilage. R. Grunfeld.

Grom, Edward. **Elephantiasis of the lids.** Klinika Oczna 19:232-240, 1949.

Elephantiasis of both lower lids in a

child, 14 years of age, is described. The etiology was not found. Her father had erysipelas at the time of its inception. There was only small cell infiltration of subcutaneous tissue. Plastic operation was successful. Sylvan Brandon.

Henderson, J. W. **Management of strictures of the lacrimal canaliculi with polyethylene tubes.** Arch. Ophth. **44**:198-203, Aug., 1950.

The author describes a method of lacrimal canaliculus reconstruction or repair. This method, used successfully in one case, makes use of a polyethylene tube threaded along the lacrimal canaliculus and sutured into the lacrimal sac. This tube was left in place 46 days without undue reaction.

Edward J. Swets.

Torgersruud, T. **Operation for entropion of the upper eyelid in trachoma.** Brit. J. Ophth. **34**:555-558, Sept., 1950.

In Ethiopia 40 percent of patients at the ophthalmic clinic have trachoma and of these 20 percent have entropion of the upper lid which is brought about by lesions of both the conjunctiva and tarsus. The only effective method of treatment is by surgery and after some experimenting a satisfactory procedure has been evolved which is hereby described; it is actually a modification of the original Blaskowicz operation. Satisfactory results were achieved in 386 operations.

Morris Kaplan.

Vrabec, F. **The histology of two mixed tumors of the lacrimal gland.** Ophthalmologica **120**:210-219, Oct., 1950.

One case proved to be a myxochondroepithelioma with adenomatous parts showing the characteristics of sebaceous glands. In the other case the solid epitheliomatous masses of tumor tissue contained small cavities filled with fibrils arranged in the shape of fans or rosettes. Histochemically these fibers reacted like collagen or elastin. Peter C. Kronfeld.

Zekman, T. N., and Stillerman, M. L. **Technic for lacrimal system irrigation.** Arch. Ophth. **44**:434-436, Sept., 1950.

Most methods for establishing the patency of the lacrimal system consist of irrigation into the nose via the upper or the lower canaliculus. Many times such a regimen fails because the block in the lower part of the system is sufficiently strong to force the injected fluid out of the opposite punctum in retrograde fashion. The logical conclusion, then, is that an insuperable closure exists and that some type of dilating probe should be passed beyond the constricted area into the nasal exit.

Probing, however, can often be avoided by blocking one punctum while fluid is gently, but firmly, injected through the other. In babies with a persistent congenital membrane at the end of the nasolacrimal duct, sufficient force may be created to rupture the membrane without probing by using this technique. The authors use the Heath punctum dilators and the Tenner lacrimal cannula.

R. W. Danielson.

16

TUMORS

Cuendet, J. F., and Moginier, A. **Bilateral metastatic reticulosarcoma of the uvea.** Ophthalmologica **120**:60-62, July-Aug., 1950.

A 67-year-old woman complained of gradual loss of vision, urinary incontinence and stiffness of most joints. The retinas were found completely detached, forming multiple pockets and folds. Translumination by diaphanoscopy gave a negative result. The medical findings indicated hypertensive cardiovascular disease with involvement of the kidneys. A month later the patient died of uremia

and heart failure. The autopsy revealed a very widespread reticulosarcoma which had probably originated from abdominal lymph glands. It had metastasized to both eyes in the form of diffuse flat infiltrations of the choroid.

Peter C. Kronfeld.

Hall, W. E. B. **Malignant melanoma of the uveal tract.** Arch. Ophth. **44**:381-394, Sept., 1950.

A case study is reported of death from metastases 30 years after initial enucleation for malignant melanoma of the uveal tract. This study illustrates certain factors: 1. Exenteration of the orbit is necessary in case of uveal melanoma. 2. The size of the initial lesion is insignificant, the original melanoma in this case occurring as a persisting recurrence or extension within the collapsed folds of Tenon's capsule. 3. The major protective value of Tenon's capsule in enclosing within its collapsed folds and locally controlling the distal nerve extension is confirmed. 4. Histologic evaluation of the orbital recurrence and of the distal metastases indicated that a malignant form of neoplasm was developing in each tumor in a case in which the original growth had probably been less malignant. This suggests that in melanoma there may be a change in cell types and, with that, a change in characteristics of cell growth and in prognosis. R. W. Danielson.

Mackie, E. G., and Edwards, J. L. **A Case of Bowen's disease of the eye.** Tr. Ophth. Soc. U. Kingdom **68**:539-544, 1948.

In a patient, 72 years old, who had been treated for one month for Mooren's ulcer, half of the cornea remained eroded. This area was covered with a conjunctival flap and the eye was quiet for five months; then a small whitish swelling resembling xerosis appeared on the surface of the conjunctiva. Four months later a new white area of erosion that resembled Mooren's ulcer began to develop in the upper portion of the cornea. Biopsy of the conjunctiva was squamous carcinoma. The eye was enucleated and further pathologic study revealed infiltrating squamous carcinoma with much inflammation. Beulah Cushman.

Rosen, Emanuel. **Hemangioma of the choroid.** Ophthalmologica **120**:127-149, Sept., 1950.

A typical case of hemangioma of the choroid in a young woman is described clinically and histologically. A thorough review of the literature yields the following characteristics and diagnostically important features of choroidal hemangiomas: onset early in life, slow rate of growth, grayish-blue to grayish-green color, discoid or lenticular shape and juxtapapillary location of the tumor; telangiectasias in other parts of the eye, and association with nevus flammeus of the face in 50 percent of the cases.

Peter C. Kronfeld.

17

INJURIES

Hoffmann-Egg, Lilly. **The significance of the histologic findings in perforating injuries.** Ophthalmologica **120**:64-68, July-Aug., 1950.

The advent of the antibiotics has produced a profound change in the histologic findings in the eyes enucleated after perforating injuries. Among 26 such eyes there were only two cases of panophthalmitis, a striking example of the effectiveness of early antibiotic therapy. Nowadays the main indication for enucleation after perforating injuries is persistent pain or irritation or both in a severely damaged eye. Several such eyes are described in detail. The clinical recognition of early sympathetic ophthalmia is still very uncertain.

Peter C. Kronfeld.

Hudelo, A., and Lallemand, Y. **Ocular tetanus.** Ann. d'ocul. **183**:787-790, Sept., 1950.

Ten days after a penetrating lid injury with a stick of wood the patient developed extraocular and ocular symptoms of tetanus. The wound, which was promptly sutured, extended into the orbit but practically did not involve the globe. The order of ophthalmic involvement was: 1. left third-nerve paralysis with retention of photomotor reflex, 2. left sixth-nerve involvement, 3. extension of paralyses to the right eye. Tetanus antitoxin was promptly administered after the onset of symptoms. Ocular symptoms regressed in the inverse order of onset. Complete ocular and extraocular recovery occurred in approximately 15 months.

Chas. A. Bahn.

Minton, Joseph. **Occupational disease of the lens and retina.** Tr. Ophth. Soc. U. Kingdom **68**:503-514, 1948.

The author discusses the diseases of the lens and retina which occur among glass and furnace workers, welders and others exposed to excessive radiation. The long infrared rays are mostly absorbed by the lens and only a small part reaches the retina. Heat cataract in glass blowers, chain makers, foundry and furnace workers results from overheating by absorption of the short infrared rays by the lens. The common eye hazards in electric and gas welding are due to the exposure of the unprotected eye to the ultraviolet radiation of the arc. Retinal injury among welders is rare; it may vary from a slight haziness of the macula to a marked edema. The eyes with mild edema may recover entirely, those with severe burns of the macula may have complete or partial loss of central vision. Investigations have shown that 12 percent of the infrared radiation of the welding arc reaches the retina of the unprotected eye. Cataract formation in one or both eyes sometimes follows burns of the body by high tension electric currents and similar cataracts have been reported in people who were struck by lightning. It may also follow the flash of a short circuit, the intensity of the light from which has been estimated to be equal to the light of 150,000 candles.

Beulah Cushman.

Pereyra, Lorenzo. **A case of a retained eyelash in the anterior chamber and lens.** Giorn. ital. oftal. **3**:286-292, July-Aug., 1950.

An eyelash was retained in the anterior chamber after a perforating wound of the cornea. Some months later severe iridocyclitis made enucleation necessary. The iridocyclitis is attributed to an allergic process. Vito La Rocca.

Shafto, C. M. **Two cases of acetic acid burns of the cornea.** Brit. J. Ophth. **34**: 559-562, Sept., 1950.

Although glacial acetic acid is used extensively in industry, few ophthalmic burns have been described. Here two similar cases are described. This acid was dropped into the eye instead of medicinal drops and in each case the eye was promptly irrigated with tap water. Immediately after the injury there was a fine honey-comb opacity of the cornea with complete staining and a severely edematous conjunctiva. The iris could not be seen. After a few days the cornea was somewhat clear and the iris became visible. It was intensely irritated, the pupil was small and fixed, and there were posterior synechiae. The corneal staining disappeared after many months, but the complete anesthesia of the cornea and the opacities became permanent. Concentrated acetic acid is a very penetrating and irritant chemical and its burns have a grave prognosis. The amount of corneal anesthesia early in the burn is a sign of direct prognostic importance. It

is more important to know that a chemical penetrates rapidly and causes iritis than to know that it is an acid or an alkali. Morris Kaplan.

Smith, J. W. **Cilium in the anterior chamber.** Arch. Ophth. **44**:424-428, Sept., 1950.

A case is reported in which a cilium was successfully removed. If cilia are not removed from the anterior chamber, the patient is needlessly subjected to the risk of the formation of an implantation cyst, glaucoma and loss of vision. The small number of cases of cilia in the anterior chamber in the literature is not a true index of frequency. A review of ocular injuries classified under lacerations of the cornea, iris prolapse, penetrating wounds and intraocular foreign bodies would undoubtedly reveal more cases of cilia in the anterior chamber. R. W. Danielson.

Sokolowski, Tadeusz. **Injuries of the eye caused by military telephone wire.** Klinika Oczna **19**:204-207, 1949.

After the war many drivers of horses have been using telephone wire as a whip. As the end of the wire becomes frayed small particles of wire composing the central core of the cable may injure and even penetrate the eyeball. The particles are either iron (.2 to .6 mm. in diameter), copper (.15 to .5 mm.) or aluminum .4 mm. in diameter. Only iron particles can be seen in X-ray pictures. Purulent panophthalmitis is frequently the result of this type of injury. Chalcosis follows the penetration of copper wire. Sylvan Brandon.

Starke, Herbert. **Hitherto unknown eyeground changes after high voltage injury.** Klin. Monatsbl. f. Augenh. **117**:249-253, 1950.

The author describes a severe burn from high voltage electric current. Distinct electric current burn marks were seen on the skull and legs. Later electric cataract developed and a cystic or cystoid degeneration of the deeper layers of the retina were seen with the ophthalmoscope. They were best visualized with indirect illumination. R. Grunfeld.

Strebel, J. **Bee sting injuries of the eye.** Ophthalmologica **120**:16-19, July-Aug., 1950.

The author sums up his extensive clinical and experimental experiences with bee sting injuries. The first clinical impression in corneal stings is that of a panophthalmitis requiring evisceration of the globe. This impression, however, is altogether wrong and most eyes stung in the cornea can be saved. The severe reaction of the eye to the sting (chemosis, hypopyon) is due to the highly toxic bee venom. The treatment in non-perforating stings consists of neutralization of the venom by the topical application of oxydizing agents such as hydrogen peroxide, and of the prevention of secondary infection. If the sting has perforated into the anterior chamber repeated paracenteses are indicated to remove the venom. At the same time the sting should be removed, preferably by spearing it and not with forceps.

A case reported in detail demonstrates that bee stings retained in the cornea and in the anterior chamber may become chemically inert and nonirritating to the ocular tissues. In the discussion Verrey reports that the hypopyon in bee sting injuries is characterized by a considerably lower polymorphonuclear and considerably higher eosinophile content than in suppurative keratitides.

Peter C. Kronfeld.

Strebel, J. **The prevention of lime burns.** Ophthalmologica **120**:68, July-Aug., 1950.

During the whitewashing of barns and stables by the farmer and his help severe

lime burns seem to occur quite frequently in Switzerland. To prevent these, Strebel, apparently a farmer as well as an ophthalmologist, recommends a number of measures pertaining primarily to the construction of the sprayers used in the whitewashing process.

Peter C. Kronfeld.

18

SYSTEMIC DISEASE AND PARASITES

Camisasca, L., and Salvadori, L. **Ocular changes of diabetes in relation to cochlearvestibular changes.** Riv. otoneuro-oftal. **25**:261-270, July-Aug., 1950.

The writers give in tabular form the results of examination of ocular, cochlear and vestibular apparatuses of 52 patients with pancreatic diabetes. The greater number of eye lesions exist in patients who present cochlear and vestibular changes. No connection was found between the gravity of the diabetes and the frequency of the associated changes.

Melchior Lombardo.

Conway, J. S. **Larval conjunctivitis.** Brit. M. J. **2**:928, Oct. 21, 1950.

Three British soldiers while on duty in Egypt developed conjunctivitis with keratitis. Larvae of the bot fly (Oestrus ovis) were removed from the conjunctiva of each soldier. The eyes cleared up completely within three days.

H. C. Weinberg.

D'Ermo, F., and Regis, V. **Retinal arterial pressure in hypertension after vitamin A administration.** Boll. d'ocul. **29**:406-419, June, 1950.

The mechanism of arterial hypertension reduced by vitamin A administration has not been fully elucidated. The authors made a long-term study of the retinal arterial pressure in patients suffering from essential hypertension during and after treatment with intramuscular injections of 100,00 units of vitamin A every third or fifth day for many months. Abstracts of the records of twelve patients show that some were suffering from ophthalmoscopically verified retinopathies, others showed only hypertensive or arteriosclerotic retinal vascular changes. Some, however, had completely normal fundi. The retinal arterial pressure values at the beginning of the observations were between 85 and 65; the systolic arterial pressure in the brachial artery was between 220 and 185 mm. Hg, the diastolic values between 130 and 95. The vitamin A treatment was carried on for 2 to 8 months and measurements were taken after 1 week, and 1, 2, 6, 8, and 10 months and after discontinuation of the vitamin administration. In all patients a slight or medium reduction of both systolic and diastolic systemic pressure was observed, and the retinal arterial pressure dropped between 5 and 25 grams (Bailliart) in all but one case. In four patients the retinal pressure remained slightly or definitely lower after discontinuing the treatment. Medication other than vitamin A was not excluded in all patients. Insomnia, headache, and visual disturbances were improved markedly. K. W. Ascher.

Heinsius, Ernst. **Fundus changes as a result of deficient nutrition.** Klin. Monatsbl. f. Augenh. **117**:19-28, 1950.

Changes in the optic nerve, such as temporal pallor of the disc, retrobulbar neuritis and optic atrophy are described as the result of starvation. These changes are seen mostly in men, while in women papilledema, slight macular edema, perivascular edema and small discolored spots in the retinal periphery are observed. Only in severe cases are angiospastic retinal changes noted in men when hypertension accompanies starvation. However, the hypertension must be considered a manifestation of starvation caused by a hormonal disturbance. When

the cell protoplasm loses low-molecular albumen, the cell loses its ability to swell and its water-binding power diminishes and consequently the tissue spaces retain an increased amount of water. Albumen deficiency may be the result of diminished supply, as in starvation or of diminished absorption caused by sickness, as in diarrhea, or it may be the result of increased protein destruction, azodiabetes. The latter may be due 1. to faculty metabolism or deficiency in peripherally acting catalyzers, 2. to hypofunction of the hypophysis, 3. loss of adrenogen steroids, 4. hyperfunction of the adrenal cortex, 5. relative vitamin B deficiency, and 6. deficiency in certain amino acids and in streptogenin, which is a tripeptid glutaminic acid, serin and glycocol. Thus, as a result of starvation a great variety of vitamin deficiency symptoms are observed mostly in men, and symptoms caused by disturbance of hormonal function chiefly in women. R. Grunfeld.

Narog, Franciszek. **Vitamins and their role in the pathology of eye diseases.** Klinika Oczna 19:1-72, 1949.

The author gives a short history of the vitamins and describes in detail vitamin A and its part in the function of the retina. Clinical pictures of avitaminosis A in 107 patients and results of experiments on rats are presented. Keratomalacia and xerophthalmia are due to changes in the epithelium and the stroma of the conjunctiva and the cornea in which there is keratinization of cells and the formation of deposits of cholesterol crystals. Many diseases, for example phlyctenular inflammation, trachoma, marginal ulcer, keratitis sicca, keratitis in diabetes and hyperthyroidism with a superimposed avitaminosis A are considerably improved by treatment with cod liver oil and preparations containing vitamin A. The author cites improvements in tuberculosis, keratitis, scleritis and episcleritis where ultra violet rays and vitamin D were given. Local use of vitamin A in blepharitis, conjunctivitis, herpes of the cornea and keratitis sicca, gave good results. Eyes with physical or chemical burns were greatly helped by administration of carotin and cod liver oil. The author presents statistical evidence to illustrate his point.

The author reviews conditions due to the lack of fat soluble vitamins D, E, K and water soluble vitamins C and B. The importance of vitamins in the resistance of the organism is stressed and the role of milk in diet is emphasized. Beneficial action of vitamins is increased by synergetic action of two or more vitamins given together. Toxic doses of vitamin A are counteracted by simultaneous administration of vitamins B and C. There is some relation between the vitamins, the hormones and the enzymes and illustrative examples are given.

Sylvan Brandon.

Wagner, Friedrich. **Band-shaped corneal opacity and iritis as symptom of a special form of rheumatic disease in a child (Still's disease).** Klin. Monatsbl. f. Augenh. 117:161-168, 1950.

The author described a case of iritis with band-shaped keratitis occurring in a 3 1/2-year-old child who was admitted to the hospital because of swelling of the left knee. This condition has been described as a separate disease entity, known as Still's disease. It occurs in the first decade of life. The arthritis affects several joints in the course of a few years. The spleen and lymphglands become enlarged. The temperature is elevated and leucocytes are found in the aspirated synovial fluid of the joint. It is regarded as a form of rheumatic infection caused by streptococcus. The iritis does not differ from other forms of rheumatic iritis. The band-shaped keratitis is due to damage of conjunctival vessels in the lid-fissure region, to trophic disturbances in the

corneo-scleral margin and to subsequent damage to the superficial corneal layer.

R. Grunfeld.

19

CONGENITAL DEFORMITIES, HEREDITY

Calamandrei, Giorgio. **Megalocornea in two cases with the syndrome of cranial synostosis.** Giorn. ital. oftal. **3**:278-285, July-Aug., 1950.

The author reports two cases of megalocornea in twins, aged 6 years, with some cranial deformities but without signs of inheritance. Vito La Rocca.

Chase, R. R., Merritt, K. K., and Bellows, M. **Ocular findings in the newborn infant.** Arch. Ophth. **44**:236-242, Aug., 1950.

The eyes of a large number of newborn infants were studied immediately after birth. Cataract with no history of maternal measles or rubella was found in 4 percent and retinal hemorrhages were found in 2.6 percent of all infants studied, and were most commonly noted shortly after birth. No case of retrolental fibroplasia was noted. Edward J. Swets.

Cometta, F., Juillard, E., and Rosselet, P. **A case of acrocephalosyndactyly.** Ophthalmologica **120**:72-78, July-Aug., 1950.

The author reports a case of acrocephaloscyndactyly (pointed head, syndactylism of hands and feet) in an infant born of normal French-Swiss parents without any history of malformations among the ancestors. The eyes were normal except for concomitant exotropia. In the authors' opinion the combination of acrocephaly and syndactyly is not a typical syndrome but just one of many variations and combinations of malformations that have occurred in man. Peter C. Kronfeld.

Sjögren, Torsten. **Hereditary congenital spinocerebellar ataxia accompanied by congenital cataract and oligophrenia.** Confinia Neurologica **10**:293-308, 1950.

The author examined four subjects, studied the families in which this rare syndrome occurred and gathered material for a statistical genetic analysis. The material consists of 14 cases in 6 families. This congenital disease, a monohybrid recessive, is characterized by idiocy, bilateral congenital cataract and a neurologic syndrome which most closely resembles a hereditary spinocerebellar ataxia. It has been described only once before. F. H. Haessler.

Sloboziano, H., and Gulesiu, T. **Contribution to the study of ocular anomalies in dolichostenomelia (arachnodactyly).** Arch. d'opht. **10**:500-504, 1950.

The authors report a case of arachnodactyly in a premature infant weighing 2.3 kilograms who survived only six days. Histopathologic study revealed bilateral degenerative lesions of the iris and lens without other ocular involvement. The iris lesions resulted from migration of the pigmented epithelial cells from the posterior to the anterior surface of the iris and to the posterior surface of the cornea where they formed nodular deposits, partially hyalinized. The lenticular lesions consisted of subcapsular lamellar opacities, with detachment of the capsular epithelium from the capsule. There was fragmentation and hydrolysis of the superficial cortical fibers. Phillips Thygeson.

Streiff, E. B. **Mandibulofacial dysmorphia with abnormal eye findings.** Ophthalmologica **120**:79-83, July-Aug., 1950.

In 1944 under the name of mandibulofacial dysmorphia Franceschetti and Zwahlen described a craniofacial malformation characterized by hypoplasia of the mandible and a sharp, beak-like nose. The term bird's head "showing a striking resemblance to Walt Disney's Donald Duck," describes the condition very well.

Streiff reports one such case in which his father had operated for congenital cataract. The eyes were microphthalmic, surgically aphakic and blind from glaucoma. A classification of the craniofacial malformations is difficult because of the numerous variations and combinations that occur in man. Peter C. Kronfeld.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Keidel, W. D. **The possibility of technical aids utilizing the remaining senses as a substitute for lost vision.** Klin. Monatsbl. f. Augenh. 117:225-242, 1950.

The author discusses the newly developed technical aids for the blind which are based on the increased utilization of the remaining senses. He describes the ultrasound-echo instrument which exploits the vibration sense as orientation guide, and describes his own experiments in this line. He further describes the new electronic reading instruments developed in the United States. R. Grunfeld.

Spaeth, E. B. **Industrial ophthalmology.** Tr. Am. Acad. Ophth. pp. 725-732, July-Aug., 1950.

Industrial ophthalmic practice in divided into three branches: 1. organization and administration; 2. engineering and research; 3. clinical application of 1. and 2. The author explains how the expense of an efficient industrial eye program is more than justified economically and socially by increased efficiency of employees, reduced incidence of accidents and decreased temporary and permanent disabilities. Practical compliance with visual standards for employees, the use of protecting and safety devices, proper lighting, maintenance of equipment and first-aid and subsequent care of injured employees are discussed. The standardization of first-aid and subsequent measures involved in the care of eye injuries and burns is explained. All chemical eye burns should receive immediate copious irrigation with water and the local instillation of hydrosulphosol solution. The localization of ocular foreign bodies, the limitations of the several methods of surgical approach and the evaluation of eye magnets and their use is discussed at length. The medico-legal status of the uniocular aphakic as revealed in recent court decisions and the restoration of binocular single vision with lenses and contact glasses is explained. The optical correction of industrial uniocular aphakia in an employee in industry is usually advisable. Gustav C. Bahn.

Ophthalmic Miniature

When normal individuals elevate or lower their glance, the upper eyelid makes a corresponding movement. In patients suffering from Basedow's disease, this is entirely abolished or reduced to a minimum. That is, as the cornea looks down, the upper eyelid does not follow.

Albrecht von Graefe,
Deutsche Klinik, 16:158, 1864.

NEWS ITEMS

Edited by DONALD J. LYLE, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received by the editor at least three months before the date of occurrence.

DEATHS

Dr. Lawson Paul Barnes, Bennettsville, South Carolina, died November 18, 1950, aged 48 years.

Dr. Matthias Lanckton Foster, New Rochelle, New York, died December 4, 1950, aged 91 years.

BOWMAN MEMORIAL FUND

The first contribution to the Sir William Bowman Memorial Fund has been received. It is a very generous one given by the members of the Research Study Club of Los Angeles.

ANNOUNCEMENTS

ORTHOPTIC EXAMINATIONS

The annual examination of orthoptic technicians by the American Orthoptic Council will be conducted in September and October, 1951.

The written examination will be nonassembled and will take place on Thursday, September 6th, in certain assigned cities and offices and will be proctored by designated ophthalmologists.

The oral and practical examination will be on Saturday, October 6th, in Chicago just preceding the meeting of the American Academy of Ophthalmology and Otolaryngology.

Application for examination will be received by the office of the secretary of the American Orthoptic Council, Dr. Frank D. Costenbader, 1605 22nd Street, N.W., Washington 8, D.C., and must be accompanied by the examination fee of $30. Applications will not be accepted after July 1, 1951.

EDUCATIONAL FOUNDATION IN OPHTHALMIC OPTICS

The Educational Foundation in Ophthalmic Optics announces the awarding of 12 $100 scholarships to students in opticianry attending the University of New York, Los Angeles City College, and Rochester Junior College. Scholarships will be awarded on a competitive basis and according to the rules established by the advisory council of each college.

The necessary promissory notes have now been prepared, making available to deserving students in either of the three colleges loans up to $500 for any one individual student, upon recommendation by the dean of the college. In that way any student deserving of financial aid may be encouraged to complete his education in opticianry.

The Educational Foundation in Ophthalmic Optics is under the supervision of the American Board of Opticianry and is managed by nine trustees representing the several branches of prescription opticianry. The $50,000 foundation is now more than half pledged, the funds having been contributed by members of the prescription optical industry in addition to some factories which have shown an interest in higher education for the optician, whose function it will be to interpret and fabricate prescriptions for members of the eye profession.

N.S.P.B. GRANTS-IN-AID

Applications for research grants from the National Society for the Prevention of Blindness should be received by April 15, 1951. Funds available are for grants-in-aid for either basic laboratory or clinical research projects that will lead to increased understanding of the etiology of blinding eye disease or improve methods of diagnosis, treatment, or prevention. Application forms may be obtained from Research Committee, National Society for the Prevention of Blindness, 1790 Broadway, New York 19, New York.

MISCELLANEOUS

IOWA SYMPOSIUM

The Department of Ophthalmology, College of Medicine, State University of Iowa, under the direction of Dr. Alson E. Braley, will conduct a symposium on "External ocular diseases" on March 20th and 21st.

Guests speakers at the symposium will be: Dr. James H. Allen, New Orleans; Dr. David G. Cogan, Boston; Dr. Trygve Gundersen, Boston; Dr. Michael Hogan, San Francisco; Dr. Frederick Theodore, New York: Dr. Phillips Thygeson, San Jose, California; Dr. Ludwig von Sallmann, New York.

GILL HOSPITAL 24TH CONGRESS

The Gill Memorial Eye, Ear, and Throat Hospital, Roanoke, Virginia, will hold its 24th annual spring congress from April 2nd to 7th. Among the guests of honor will be: Major Gen. R. W. Bliss, Surgeon General, United States Army, Washington, D.C.; Dr. Jerry W. Conn, professor of internal medicine, University of Michigan Medical School, Ann Arbor; Dr. A. D. Ruedemann, professor of ophthalmology, Wayne Medical College, Detroit; Dr. R. Townley Paton, clinical professor of ophthalmology, New York University, New York; Dr. C. Stewart Nash, otolaryngologist, University of Rochester, Rochester, New York; Dr. John R. Lindsay, professor of otolaryngology, University of Chicago Medical School, Chicago.

In addition to the guests of honor the visiting

faculty will include: Dr. D. H. Anthony, Memphis; Dr. Edwin N. Broyles, Baltimore; Dr. Edwin W. Burton, Charlottesville, Virginia; Dr. J. Gordon Cole, New York; Dr. John M. Converse, New York; Dr. Robert A. Cooke, New York; Dr. Arthur G. DeVoe, New York; Dr. Paul H. Holinger, Chicago; Dr. R. W. Hollenhorst, Rochester, Minnesota; Dr. Wendell L. Hughes, Hempstead, New York; Dr. William P. McGuire, Winchester, Virginia; Dr. Lawrence Pool, New York; Dr. Harold G. Scheie, Philadelphia; Dr. Byron Smith, New York; Dr. Joseph A. Sullivan, Toronto; Dr. Harvey E. Thorpe, Pittsburgh; Dr. Robert H. Trueman, Philadelphia.

Resident members of the faculty are: Dr. Elbyrne G. Gill, Dr. Frederick D. White, Dr. Houston L. Bell, Dr. Robert D. Mertz, Dr. Angel V. Stumbof, Dr. John O. Redding, and Dr. Doris Janes.

PITTSBURGH COURSE

The Committee on Graduate Education, Allegheny County Medical Society, sponsored the course on "Slitlamp microscopy of the living eye," given by the department of ophthalmology, Montefiore Hospital, Pittsburgh, February 26th through March 1st. Dr. Harvey E. Thorpe directed the course which also included instruction in "Gonioscopy," "Deep vitreous and retinal biomicroscopy," "Management of intraocular foreign bodies," "Management of complications in cataract surgery," and Application of ACTH and cortisone in ophthalmology."

Societies

GEORGIA SOCIETY

The Georgia Society of Ophthalmology and Otolaryngology held its annual meeting at the General Oglethorpe Hotel, Savannah, March 2nd and 3rd.

Lecturers at the meeting were: Dr. A. D. Ruedemann, Detroit, "Cataracts as a medical problem," and "Selection of the type of operation in cataract surgery"; Dr. Peter C. Kronfeld, Chicago, "Diagnosis and medical treatment of the glaucomas" and "The surgical treatment of the glaucomas"; Dr. William C. Owens, Baltimore, "Surgical treatment of horizontal muscle deviations" and "Surgical treatment of vertical muscle deviations"; Dr. C. Stewart Nash, Rochester, New York, "Functional diseases of the nose" and "Otolaryngological mishaps"; Dr. Philip Meltzer, Boston, "Simple, practical therapeutic measures in otologic practice: Surgical and nonsurgical" and "The conservation of hearing in chronic suppurative otitis media"; Dr. Edwin C. Broyles, Baltimore, "Tumors of the larynx: Benign and malignant" and "Summary of otolaryngological conditions that require expert attention."

N.S.P.B. CONFERENCE

The 42nd anniversary conference of the National Society for the Prevention of Blindness will be held March 28th through March 30th at the Hotel New Yorker, New York.

Dr. Franklin M. Foote, executive director, said that plans to develop broader and more effective prevention of blindness programs at the community level will be one of the main points discussed at the conference. The conference will also hear reports on the latest developments in ophthalmic research.

CENTRAL ILLINOIS MEETING

The next meeting of the Central Illinois Society of Ophthalmology and Otolaryngology will be held at the Fort Armstrong Hotel in Rock Island, Illinois, on April 20th, 21st, and 22nd. Guest speakers will be Dr. Dean McAllister Lierle, Iowa City; Dr. Joseph Gemeroy, Detroit; and Dr. Stuart Cullen, Iowa City. Dr. George L. Porter and Dr. Leonard DeLozier, members of the society, will also speak.

RICHMOND OFFICERS

Officers of the Richmond, Virginia, Eye, Ear, Nose, and Throat Society are: President, Dr. Edwin D. Vaughan; secretary-treasurer, Dr. Charles N. Romaine. The society meets the first Tuesday of January, March, May, and October at the Commonwealth Club.

MASSACHUSETTS ALUMNI MEETING

At the annual meeting of the alumni of the Massachusetts Eye and Ear Infirmary, the following program was presented:

Dr. David G. Cogan and Dr. David D. Donaldson, "Experimental production of radiation cataracts"; Dr. Robert J. Fink, "The effects of X-ray on the lacrimal gland"; Dr. Thomas Cavanaugh, "Cataract extraction: Using the erisophake"; Dr. Robert R. Trotter, "Clinical interpretation of unilateral exophthalmos"; Dr. Edwin B. Dunphy and Dr. Bertram Selberstone, "Distribution of radioactive phosphorus in ocular tissues"; Dr. W. Morton Grant, "Clinical measurements of aqueous outflow"; Dr. V. Everett Kinsey and Dr. Julian F. Chisholm, "Results of current study on retrolental fibroplasia"; Dr. Henry A. Mosher, "Local treatment with cortisone for a variety of ocular conditions"; Dr. Frank Carroll, "Acute vascular lesions of the optic nerve"; Dr. Francis J. West, "History of the Massachusetts Eye and Ear Infirmary, 1824-1899"; Dr. Lorand V. Johnson, "Greater superficial petrosal neurectomy for the relief of chronic bullous keratitis"; Dr. Marvin Posner, "The effect of certain autonomic drugs on the myotonic pupil"; Dr. Brendan D. Leahey, "Treatment of bullous keratitis secondary to vitreous contact."

RESEARCH ASSOCIATION PROGRAM

At the meeting of the East Central Section of the Association for Research in Ophthalmology held in Cincinnati, the following papers were presented:

Dr. Edgar E. Poos, Detroit, "Autonomic-nervous-system manifestations in ophthalmology"; Dr. Albert A. Dietz, Dr. Ernst Schmerl, and Dr. Bernhard Steinberg, Toledo, "Certain chemical characteristics of pituitary principles affecting intraocular pressure"; Dr. John W. Patterson, Cleveland, "Diabetic cataract formation"; Dr. C. G.

Smith and Dr. R. Baird, Toronto, "The effect of experimental ischemia on the retinal cells due to intraocular-pressure increase"; Dr. Jay G. Linn, Jr., "An experimental evaluation of the effects of various anticholinesterase agents."

Part A of "Studies on the toxic effects of methyl alcohol on the visual organ," entitled "The effect of methyl alcohol and its oxidation products on retinal metabolism," was presented by Dr. Albert M. Potts, Dr. Lorand V. Johnson, and Miss Doris Goodman, Cleveland; Part B: "The effect of parenterally administered substances on the systemic toxicity of methyl alcohol," was presented by Dr. Anita P. Gilger, Dr. Albert M. Potts, and Dr. Lorand V. Johnson.

Other papers were: Dr. Arthur M. Culler, Columbus, Ohio, "Prophylaxis against ophthalmia neonatorum with aureomycin: Second series"; Dr. Harold F. Falls, Ann Arbor, "Ocular complications encountered in cranial arteriography"; Dr. Harvey E. Thorpe, Pittsburgh, "Experiences with ACTH and cortisone in ocular trauma and in eye surgery"; Dr. Glenn O. Dayton and Dr. Werner Weingarten, Buffalo, "The effect of ACTH on experimentally produced exophthalmos."

Guest speaker of the evening was Dr. Albert Sabin, University of Cincinnati, who spoke on "The eye and I: The microbiologist's use of the eye in research."

Puget Sound officers

Officers of the Puget Sound Academy of Ophthalmology and Otolaryngology are: President: Dr. John F. Tolan, Seattle; president elect, Dr. H. Fred Thorlakson, Seattle; secretary-treasurer, Dr. Willard F. Goff, Seattle; trustees, Dr. R. F. Kaiser, Bellingham; Dr. W. H. Ludwig, Tacoma; Dr. L. L. Bull, Seattle; Dr. C. V. Lundvick, Tacoma; Dr. F. H. Wanamaker, Seattle.

N.S.P.B. affiliates

Dr. Franklin M. Foote, executive director of the National Society for the Prevention of Blindness, announces the affiliation of the Erie County Branch of the Pennsylvania Association for the Blind and the Philadelphia Committee for Prevention of Blindness with the national society.

Brooklyn meeting

The 115th regular meeting of the Brooklyn Ophthalmological Society was held on February 15th at which time Dr. Samuel J. Meyer of Chicago, presented a paper on "The physiopathology and the technique of iridencleisis." During the instruction hour, Dr. Rudolf Aebli, New York, discussed the "Basic principles of extraocular muscle surgery."

Midwestern research meeting

The third annual meeting of the Midwestern Section of the Association for Research in Ophthalmology will be held at University Hospitals, Iowa City, Iowa, on March 19th. Papers to be presented at the meeting are:

Dr. Paul W. Miles, Saint Louis, "The relation of perceived size to projection on the horopter"; Dr. T. F. Schlaegel, Indianapolis, "The dominant method of imagery in blind as compared to sighted adolescents"; Dr. Emanuel Stillerman, Chicago, "Electro-encephalographic findings in strabismus"; Gordon S. Christensen, Ph.D., and Dr. P. S. Leinfelder, Iowa City, "Apparent metabolic activity of denatured lens."

Dr. A. E. Braley and R. C. Alexander, M.S., Iowa City, "The folic acid antagonists in tissue culture of viruses"; Dr. Albert C. Biegel, Chicago, "The effect of cortisone therapy on horse serum uveitis"; Dr. Frank W. Newell, Chicago, "The effect of cortisone on the immediate union of experimental corneal grafts"; Dr. S. Albert Hanser, Saint Louis, "The cytology of allergic conjunctivitis"; and Dr. Nicholas G. Douvas, Iowa City, "The role of terramycin in ophthalmology."

Personals

Dr. Harold F. Whalman has resumed the position of professor of ophthalmology and head of the eye department at the College of Medical Evangelists, Los Angeles, California.

Dr. F. Bruce Fralick, Ann Arbor, Michigan, will deliver the second annual John E. Weeks Memorial Lecture on March 26th at the 12th annual spring convention of the Oregon Academy of Ophthalmology and Otolaryngology, Portland, Oregon. The subject of Dr. Fralick's address will be "Warthin, Selye, and the thymicolymphatic constitution."

Dr. Arthur A. Knapp spoke at a meeting of the Wilkes-Barre (Pennsylvania) Ophthalmological Society recently on "Criteria for surgical decision." Dr. Knapp also showed a movie on "Tattooing with iridectomy."

Dr. William L. Benedict recently addressed a joint meeting of the Washington and Baltimore Ophthalmological Societies in Washington, D.C. The subject of Dr. Benedict's address was "Diseases of the orbit."

Dr. John H. Dunnington, director of the Institute of Ophthalmology of Presbyterian Hospital, New York, has been elected to the board of directors of the National Society for the Prevention of Blindness.

The new address of Dr. Giambattista Bietti is Clinica Oculistica dell'Universita, Parma, Italy. Dr. Bietti is now director of the clinic.

PRESCRIPTION OPTICIANS

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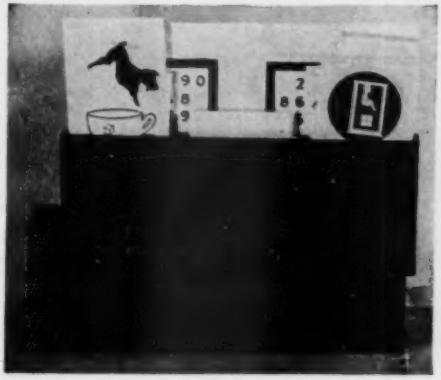

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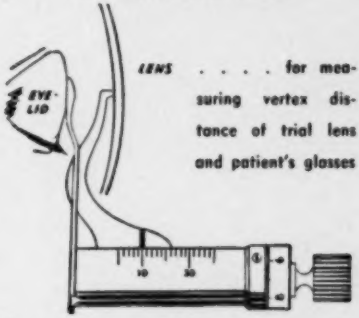

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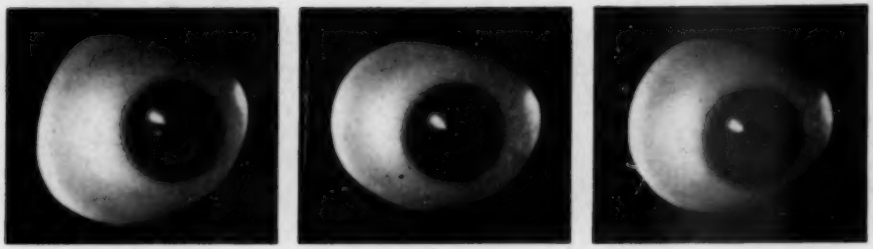

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